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AERIAL AGE WEEKLY

Vol. 6, No. 1 SEPTEMBER 17, 1917 10 CENTS A COPY



The attack on the British steamship "Gena" by a German Torpedoplane. This is evidence that the Germans have appropriated Admiral Fiske's idea. To make sure that the United States gets a torpedoplane in the near future, Mr. Godfrey S. Cabot, Vice President of the Aero Club of America, has placed $30,000 at Admiral Fiske's disposal to get a torpedoplane.

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From America to Kiel via Air Route

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Engineering Library

FROM AMERICA TO KIEL VIA AIR ROUTE

A SOLUTION is offered to the problem of delivering aeroplanes to Europe which is now the problem that stands in the way of striking Germany through the air and bringing within sight the end of this war which is costing the Allies $500,000,000 and 5,000 lives per day.

The solution suggested is to fly the machines across the Atlantic—and it seems a daring suggestion. But when we analyze it, and we consider the tremendous efforts the hundreds of thousands of men and huge amounts of explosives, and other war implements that are required to advance even only a few feet on the different fronts; and when we consider that in the recent Messines action there had to be blown up an entire mountain, requiring well nigh two years of efforts—when we consider these things, the flight across the Atlantic seems a dream of simplicity.

From America to Kiel by air route means flying from any one point on the American continent to the Azores and from there to England and then to Kiel. The longest leg of the journey over water is less than 1,500 miles. The distance from St. Johns to the Azores is less than 1,250 miles and it is not over that distance to Ireland. An Italian aviator has flown 1,000 miles without stopping and a German aviator has flown 24 hours and 12 minutes without stopping. The altitude record is 26,260 feet.

Major R. Perfetti, the head of the Special Italian Mission for Aeronautics in the United States, says that the largest of the Caproni machines can do it and the Italian officer Silvis Resnati, who has flown the large Caproni machines for 2,200 hours says he considers the flight feasible and will be glad to undertake it.

The Aero Club of America has had the best scientists and experts at work on the tables and instruments required to simplify the navigation part of the plan, and practically all the problems have been solved.

Therefore everything is ready to be put into effect.

Everything possible should be done to insure success to this plan which means so much to the cause of Humanity.

If undertaken at once, by early spring the first series of trial flights can be made and by summer thousands of huge warplanes may be delivered to England and France by air and the plan of striking Germany through the air can begin.

Major Perfetti's statement to the Aero Club of America and the National Special Aid Society printed in AERIAL AGE last week has created great interest and the idea received the endorsement and approval of the press.

The New York *Times* printed two editorials as follows:

Through the Air to the Front

The hope that hosts of allied aeroplanes might "strike Germany through the air" was born of the fact that the German Army barred the way by land. That hope is approaching realization now that the United States has entered the war and has been committed to the construction and training of a huge aerial fleet. Work well begun is half done, and certainly the United States, with a reorganization and expansion of the aeroplane industry which holds promise of an eventual output of 100,000 machines a year, has made a good beginning.

There remains, however, the task of transporting the machines and the men to operate them across the seas. There the U-boat impedes the way as Hindenburg's line presents an obstacle by land; not to the same degree, for in large measure the U-boat menace has been met by the practice of convoy and of destroyer patrol, yet to an extent which renders the speedy transport of materials and men uncertain and dangerous.

So far this task has presented no immediate problem, for the United States is not yet ready to send aeroplanes abroad by the tens of thousands. But that time is coming. With its ever-nearing approach, the suggestion of Major R. Perfetti, head of the Special Italian Aeronautic Commission to the United States becomes increasingly pertinent, increasingly one to be pursued with vigor and hope. He proposes that the aeroplanes truly "strike Germany through the air" by actually flying from this country to Europe. He is confident that it can be done, and is willing to lend his official influence to bring about a test of the plan's feasibility.

He proposes that a Caproni triplane, equipped with three motors of 700 horse power each, start from Genoa, fly to some point in Spain, then to the Azores and finally to Halifax. Lieutenant Silvo Resnati, who has flown a Caproni machine a total of 2,200 hours, agrees with his chief that the flight can be made. The corollary is obvious. The flight may as well be made in the opposite direction.

Not all aircraft could make such a journey. Many would still have to be shipped in vessels, as they are now shipped. But there can be no doubt of America's ability to duplicate the Caproni machine, and, assuming that Major Perfetti's confidence is not misplaced, the result of enthusiasm rather than of calm judgment, there equally can be no doubt of this country's ability to fly thousands of aeroplanes direct to the European battlefront, there truly to "strike Germany through the air."

Transatlantic Flight

Editorial in New York *Evening Sun*

Such is the confidence that General Cadorna's sweeping offensive inspires that Americans are prone to accept the assurance given by Italian airmen at their reception by the Aero Club of America, that their new Caproni machine is pre-eminently qualified for tranatlantic journeys. The suggestion furthermore has a distinctly utilitarian aspect, for it is not merely a proposal for an exhibition flight from the old world to the new. The commission wish to see the machines built in this country and flown to the theatre of war.

It may be that the Caproni warplane of some 2,000 horsepower has signal advantages over the greatest machines yet built in Britain or America. Be that as it may, all signs portend a dawning era of transatlantic flight. From Newfoundland to the Azores is a feasible first leg, whence Portugal is readily attained. Of still more interest to the present generation would be a demonstration of wing power bringing all points of Europe's flatlands within scope of a fiery scourage.

If the Italian Government wishes to co-operate, the Administration would do well to incubate a brood of the Caproni war birds.

MR. GODFREY L. CABOT'S GENEROUS CONTRIBUTION TO AERONAUTICAL DEVELOPMENT

MR. GODFREY L. CABOT of Boston, a Vice-President of the Aero Club of America, has become so impressed with the unpreparedness of the Navy in aeronautics, and with the possibility that the Germans may destroy the British fleet with torpedoplanes, unless we forestall them by destroying the German fleet, that he has placed $30,000 at the disposal of Admiral Fiske. Mr Cabot desires Admiral Fiske to produce a torpedoplane that can carry the heaviest torpedo direct from England to Kiel; and he has intimated that, it $30,000 is not enough, he will give as much more as may be necessary.

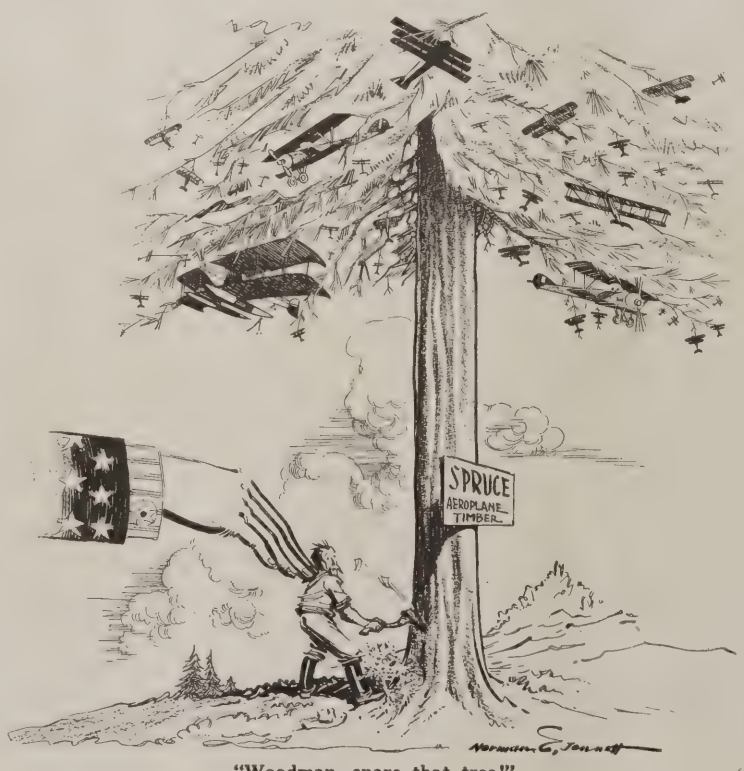
Mr. Godfrey L. Cabot, who is the president of the Aero club of New England, has been interested in naval aeronautics for several years. In 1915, he took steps to organize the aeronautic division for the Naval Militia of Massachusetts, accepted a commission as Lieutenant in the Naval Reserve, and purchased a hydroaeroplane which he has flown for the past two years. At the time of our declaration of war, the aeronautic divisions of all the New England States were mobilized at Marblehead Neck and Mr. Cabot became the Senior Officer, and flew daily over Salem and Boston harbors, doing aerial coast patrol duty.

Mr. Cabot was prompted to his generous and patriotic act by the letters of Admiral Fiske to Mr. Alan R. Hawley, President of the Aero Club of America, written during the past six months. It will be recalled that, in these letters, Admiral Fiske pointed out that the most vulnerable point of Germany seems to be in the region near Kiel and Wilhelmshaven, where the entire German navy, although protected from attack from seacraft by many rows of mines, is thoroughly exposed to an attack by torpedoplanes, and that the destruction or even crippling, of the German navy would put a stop to submarine operations, and would, therefore, end all danger to Great Britain, the United States and the commerce of the world.

It is hoped that the action of Mr. Cabot will bring to fruition the work which the Aero Club of America has been engaged upon, of developing the torpedoplane able to sink a battleship. Admiral Fiske patented the torpedoplane in the United States in July, 1912. His invention was not taken up by the United States Government, but it was taken up by the Governments of Great Britain, Italy and Germany. The British navy began experiments with it in the autumn of 1913, and the Italian navy, thanks to the initiative of Captain Alessandro Guidoni, in 1914; and the British sunk four Turkish vessels with it in August, 1915. Exactly what the German navy did, prior to May 1st of this year, we do not know, but we do know that the British ship GENA was sunk by a German torpedoplane off the coast of England the 1st of May, 1917. As this attack was successful, it is to be presumed that the German navy is developing the torpedoplane seriously.

Last January the attention of the Aero Club of America was attracted to the lack of interest taken in the torpedoplane by our country, and it immediately set aside a sum of money, and placed it at the disposal of Admiral Fiske, to have a small torpedo made suitable for use from ordinary aeroplanes; thinking it better to start the work in this way rather than to attempt to build an aeroplane large enough to carry the regular battleship torpedo. When the question of building a small torpedo was taken up with the E. W. Bliss Company, they patriotically decided to develop the torpedo at their own expense.

The action of Mr. Cabot, supplementing that of the Aero Club of America, it may now be confidently predicted, will result in the production of a powerful torpedoplane that will be one of America's most important contributions to the war.



"Woodman, spare that tree!"

THE MONITOR AND THE TORPEDOPLANE

Dealing with Mr. Cabot's patriotic action, the N. Y. *Sun* writes editorially as follows:

"Mr. Godfrey L. Cabot of Boston, the public spirited citizen who has agreed to furnish the funds necessary to build the torpedoplane designed by Admiral Fiske, as a weapon wherewith to attack the German fleet within its defenses at Kiel, has an impressive precedent for his act.

"Only Americans far and away beyond the draft age can recall the terror produced by the first day's performances of the Confederate ironclad Merrimac when on March 8, 1862, she destroyed at their moorings the ships of war Congress and Cumberland, and returned unhurt to her station. Washington was frantic with apprehension of an invasion, and the Secretary of the Navy, Gideon Welles, tells in his diary how Cabinet members interrupted a meeting to peer fearfully from the White House windows down the Potomac for the dreaded monster. New York feared that her harbor would be entered and her banks and treasure vaults laid under contribution. The whole country lamented that the blockade was certain to be broken, the ports of the South thrown open to the trade of the world, and the way prepared for Confederate recognition.

"All the world knows how, a day later, these fears were quieted by the crushing defeat of the Merrimac by Ericsson's newly invented Monitor. But all the world does not know, though it should, that the little ship that battled for the nation was not the property of the nation, but was built by a private citizen, C. S. Bushnell of New Haven, at his own expense and against the stolid opposition of the Navy Department of that day. It was not paid for until long after the action.

"There is an easy parallel to be drawn between the official indifference to Ericsson's Monitor and that now manifested toward Fiske's torpedoplane. We hope the public spirited Bostonian, Mr. Cabot, who has come to the rescue today, may lay his country under as deep obligations as did Bushnell of New Haven in 1862. New England, after all, is pretty good territory to count on in time of national need."



THE NEWS OF THE WEEK



American Flyers Joining Own Colors

Paris—With the intention of transferring the members of the Lafayette Escadrille to the American Army, Gen. Pershing's officers went to the Verdun front and presented slips asking the men to announce their desire to be transferred or to remain in the French Army.

Greater pay and the desire to serve under their own flag decided nearly all of them to ask for a transfer.

Willis Haviland of Minneapolis left the escadrille to join the regular French Flying Corps on another part of the front. Edwin C. Parsons of New York remains for the present with the Lafayette Escadrille.

It is believed that the transfer of the other men will take a long time, as the French Army must first give them a release. This is the first actual step indicating that Americans now flying for France will be taken over by the American Army.

Cuba Organizes Aviation Unit

Col. Manuel Coronado, member of the Cuban Senate and editor of the newspaper *La Discusion*, has organized an aviation unit which will be offered to France, with complete equipment, in the near future. It is probable, from the enthusiasm shown by its ninety-odd members that the "Escadrille Cubaine," as the flying unit will be called, will be the first body of fighting men from Cuba to serve on French soil.

Col. Coronado's original plans called for a body of twenty-five trained aviators to comprise the escadrille, but already nearly 100 youths, who are representative of the best families of Cuba, have volunteered to take the prescribed aviation course and individually to bear the expense of their aeroplanes and equipment. Senator Coronado has just returned from New York, where he conferred with officials of the Aero Club of America and aeroplane manufacturers over the details of the escadrille's organization. Many of the volunteers for the escadrille are graduates of French universities.

"I believe that the escadrille will be the most practical and at the same time the most appropriate way of showing Cuba's sympathy with the cause of the Allies," said Col. Coronado. The colonel has asked the Navy Department in Washington for an arrangement by which the Cuban aviators may undergo their preliminary training at the Navy Aviation School at Pensacola, Fla.



Godfrey L. Cabot, the patriotic New England citizen, who has donated $30,000 toward the carrying out of practical experiments with the Fiske aerial torpedo

Vernon Castle to Aid Here

Fort Worth, Tex.—Vernon Castle, the erstwhile dancer, will be an instructor at the Fort Worth Aviation School here, it is announced. Major Lord Wellesley, son of the Duke of Wellington, also has been assigned to the Fort Worth camps as instructor.

Allies Take Step to Standardize Aircraft

Washington.—The Government's great aircraft production programme took another step forward today. The International Aircraft Standards Board, consisting of representatives of all the allied nations and a number of American engineers, adopted standards for steel, aluminum, cable, sheet metal, tubing, bearing metals and turn buckles.

Similar standardization of composite materials and aeroplane parts remains to be accomplished before manufacturers can start turning out machines on a large scale. An announcement concerning engine standards is expected soon.

Poincare Receives Augustus Post

Paris.—Augustus Post, of New York, delegate of the Aero Club of America, accompanied by William Graves Sharp, the American Ambassador, was received by President Poincare in order that Mr. Post might deliver a message of greeting from the Aero Club of America to France, expressing the Club's "most heartfelt sympathy at a moment when the aviators of France and the United States are fighting side by side."

600 Aviators Will Train at Princeton

Princeton, N. J.—Although it is still three weeks before the opening of college many university men are here to arrange for lodgings or are tutoring to remove conditions. Several students who recently received commissions have returned for a brief farewell and to attend to affairs which they left hurriedly in May.

While college is in session six hundred aviators will train at Princeton and three of the university dormitories have been requisitioned by the government for their use.

New Altitude Record

The flight made by Mr. Caleb Bragg of Port Washington for altitude record has been homologated by the Aero Club of America, the figures allowed being 12,900 feet. This record is an American Hydroaeroplane Altitude record for pilot and two passengers. Flight was made from Port Washington, L. I., on August 25th, 1917. With the pilot, Mr. Bragg, were Mr. Harry Guggenheim and Mr. K. A. Craig as passengers. The machine used was a Wright-Martin "F.B.A." flying boat, equipped with a 150 h.p. Hispano Suiza motor.

Previous record of this class was held by Mr. Floyd Smith, 9,524 feet.



The American Aeronautic Commission, including Major Raynal C. Bolling and Lieut. Childs, visiting the Pomilio factory at Sesto Calendo, Italy



Frank Champion, starting on an exhibition flight at Kobe, Japan

Frank Champion Flying in Japan

With a Morane-Saulnier monoplane, Frank Champion has been giving exhibition flights at Kobe, Japan. On July 25th Champion looped the machine for the first time, and up to August 1st has had the machine in ten loops. Another stunt which Champion has found easy is the tail slide explained by him as follows:

"From flying parallel with the ground I give the machine all the elevator for the vertical climb; when the machine is perpendicular or nose-up, I shut off the motor, and as she starts on the tail slide I push my elevator forward, causing the machine to slide out of the tail drop with the machine in an upside-down position. By holding the elevator in this position the tail gradually goes upward until it again stalls with the tail headed up at an engle of about 45 degrees. With the machine in this position, cut on the motor as she starts head down, at the same time pulling the elevator lever toward you. After a few feet of drop the propeller starts and the motor picks up. The elevator is still held toward you until the machine reaches an even keel, right-side up with care."

Bill to Buy Land for Training of Aviators

Albany, Sept. 7.—At the request of Secretary Baker and under an emergency message from Governor Whitman a bill is before the Legislature to make the practice in acquiring land in New York State for Federal aviation fields the same as the law governing the taking of land for fortifications. Immediate passage of the measure was asked so that there might be as little delay as possible in the acquisition by the Government of property to be used for aviation purposes.

French Aviation Instructors Coming

Paris, September 7.—Georges Carpentier, the French pugilist, at present an aviator in the French army, according to the *Herald*, is going to the United States as an aviation instructor, and will be stationed at Dayton, O. Second Lieut. Jean Navarre, who is credited officially with having brought down twelve German machines, is also going to America on a similar errand.

Representative Joins Army, Loses His Seat and Pay

Washington.—A Representative who joins the army automatically vacates his seat and is not entitled to further pay. Sergeant-at-Arms Gordon, on the advice of attorneys, has so decided in the case of Representative La Guardia, of New York City, who joined the Signal Corps late in August and now has asked for his pay for that month.

"If the Germans don't get me, I'll get that pay." La Guardia today declared, "I'll take the case up at the close of the war."

Wire Wheels for Aeroplanes

The National Wire Wheel Works, Inc., manufacturers of "Pasco" wire wheels for aeroplanes and automobiles, has a capacity of from 400 to 800 wheels per day of a standardized type, and is in a position to attend to the requirements of individual aeroplane manufacturers and through the aircraft manufacturers association, in an effort to minimize cost and bring about maximum production.

Patented features of the "Pasco" wheel should appeal to makers of aeroplanes, as the four-series rim-punching and spoke lacing is claimed to produce an unusually strong wheel. All spokes cross four other spokes both in the front and rear, forming a strong double steel web in the spoke lacing of the wheel and rim.

Aeroplane manufacturers who have investigated this wheel have suggested that their use be taken up with other manufacturers of aeroplanes, so as to produce the highest possible point of efficiency in quality and quantity production. The increasing demand for the "Pasco" wheels for automobiles has grown to such an extent that a new factory is under course of construction which will treble the present space and equipment. Interested aeroplane manufacturers in communicating with the company at Geneva, N. Y., are assured the fullest co-operation.

Walter E. Johnson Veteran Aviator

September 7th is the seventh anniversary of Mr. Walter E. Johnson's first flight, and he can probably claim the distinction of being (in point of experience) the oldest aviator who is not a manufacturer, having flown continuously for seven years. This, of course, does not include Wright or Curtiss, although neither of these men have flown for some time.

In 1914, Johnson tested the first Curtiss R boat with a 160 H.P. motor, and when Keuka Lake froze over he was given the Langley machine with which he made several flights from the ice, using the original Langley motor. During the summer of 1915, he was sent to Russia by Curtiss to deliver an order of K boats to the Russian Admiralty at Sevastopole on the Black Sea. He left the Curtiss Co. in April, 1916, to take charge of the Philadelphia School of Aviation at Essington, Pa. From May until October he flew a total of 250 hours instructing students.

About the first of this year the Government purchased the Essington School, established it as a temporary Signal Corps Aviation Station, retaining Mr. Johnson as Chief Civilian Instructor.

Marmon Returns From Europe

Washington.—Captain Howard Marmon has returned from England, France and Italy, where he went to visit all of the aviation factories and study the problems of aviation. He has taken up his office in the Bureau of Standards, where he will carry on the work done by Jesse G. Vincent. Mr. Vincent will continue his work on the testing fields, where he will observe the performance of engines and work hand in hand with Mr. Marmon. Captain Marmon is particularly impressed with the U. S. aviation motor which has been developed in Washington and which does not contain any radical features of design but which has incorporated in it the best aviation engineering practice of all the warring nations. Captain Marmon thinks it practically a marvel that this engine should have been developed and tested out in such a short time.



The Italian Aeronautic Commission now in America. From left to right: Lieut. A. Testoni, Lieut. M. Ballerini, Lieut. S. Resnati, Lieut. S. D'Amico, Major R. Perfetti, Capt. S. Tappi and Lieut. G. Adamali



Officers of the Standard Aero Corporation, which has just acquired the factory of the J. G. Brill Car Works at Elizabeth, N. J., as told in last week's Aerial Age

Compared with the European engines it is an excellent product. Captain Marmon feels that Italy is the leader in aviation, notwithstanding the great progress that has been made by France and England. Italy's problem has been that of building machines to scale the mountain tops and carry large tonnage of bombs, a problem which is greater than that having to be faced by the other Allies. When Captain Marmon sailed for Europe several men from different factories went with him, the majority of whom are still abroad to execute Captain Marmon's orders.

Establish Ball Bearing Bureau

Washington, D. C., Aug. 30.—A group including the Fafnir, Gurney, Hess-Bright, New Departure, Norma, S. K. F., Standard Roller, and U. S. ball bearing companies have opened an office in the old Southern building and have combined to maintain a bureau, to be known as the Ball Bearing Manufacturers Engineering Bureau, where they will have two representatives who, in the combined opinion of all the manufacturers, are the most competent in their line. This has been done for the purpose of giving advice and information to the government and making recommendations and layouts wherever bearings are involved.

The first two resolutions adopted by the organizers of the Bureau read as follows:

"That it is the sole purpose of the manufacturers combining to establish this bureau, to afford the U. S. Government a quick and easy means of obtaining technical advice and information which shall embody the best technical advice and experience of the combined ball-bearing manufacturers of the country.

"That no reputable ball bearing manufacturer who wishes to participate shall be excluded from the benefits of the bureau."

The representatives of the bureau will be J. H. Baninger and H. Wickland.

Caleb Bragg Makes Altitude Record

The Aero Club of America has homologated the flight made by Mr. Caleb Bragg at Port Washington, Long Island, Aug. 25, for the hydro-aeroplane two-passenger altitude record. Mr. Bragg, carrying with him as passengers Mr. Harry Guggenheim and Mr. K. A. Craig, attained a height of 12,900 feet, thereby establishing a new American record for this class of flight.

The previous record, made by Floyd Smith at North Island, California, February 11, 1916, was 9,524 feet.

Mr. Bragg used in this flight a Wright-Martin "F. B. A." flying boat, equipped with a 150 horse power Hispano-Suiza motor.

Court Bars the "Golden Cross"

The New York *Times*, for September 8, printed the following about the so-called "Golden Cross" about which we have received inquiries, the organizers having solicited subscriptions from concerns and individuals:

"A petition for the incorporation of the Order of the Golden Cross, organized to aid soldiers injured in the American army and navy aeronautical service, was denied yesterday by Supreme Court Justice Mullan for this reason: 'It is sought to create an institution that would have many of the characteristics of a hospital. The proposed sphere of activity is properly and adequately covered by the Red Cross, now so closely in co-operation with the United States Government.'

"A previous petition for incorporation was denied in July by Justice Ordway on the ground that it appeared that the founders proposed to maintain a hospital and give medical treatment, and for this purpose the approval of the State Board of Charities was required. Justice Giegerich gave his aproval on Aug. 6, but the Secretary of State requested that a new certificate of incorporation be filed containing certain changes.

"The petition submitted yesterday expressly says the organization does not propose to establish a hospital or furnish medical treatment, but only to provide accommodation for those discharged from medical treatment, but who need rest and aid during convalescence, or who between periods of service need rest and recreation.'

"The list of incorporators includes Walter L. Post, John Whalen, Charles Wesley Howell, Frederick W. Barker, Francis T. Sanford, C. William Wurster, Clifford B. Griswold, William J. Hammer, Mrs. E. Proctor Field, and Ernest D. Anderson."

Aviator W. E. Dugan Weds

A wartime wedding of interest was celebrated quite recently when Miss Ramona Adams, daughter of Dr. and Mrs. Myron Howell Adams of Rochester, became the bride of William Edward Dugan, Jr., a member of the Lafayette Escadrille, who received twenty-one days' furlough from the French Government for his marriage. The ceremony was performed at the residence of Mrs. Dawson J. Burns, a niece of the bride, at Bronxville, N. Y., the Rev. Dr. Otis T. Barnes officiating.

Mr. Dugan was married in his aviation uniform, and wore the medals that he had won in the World War, having been in active service in France since Sept. 19, 1914. He is a son of William E. Dugan of Rochester, where he was feted on his arrival on Sept. 1 from Europe with a large dinner given at the Oak Hill Country Club by the Chamber of Commerce of that City.

E. H. Smith a Captain

Earl Hamilton Smith, aid to Rear Admiral Robert E. Peary in the aeronautical preparedness campaign of the past two years, who was commissioned a captain quartermaster in the Reserve Corps of the Army several weeks ago, has been ordered to active duty at Fort Myer.

Capt. Smith is a newspaper man and has been secretary of the National Aerial Coast Patrol Commission, of which Admiral Peary is chairman and Vice President Thomas R. Marshall honorary chairman. Other members of the commission are Assistant Secretary of War Ingraham, Assistant Secretary of the Navy Newton, Senator Sheppard of Texas, Representative Julius Kahn of California, Representative Murray Hulbert of New York, John Hays Hammond, Jr., and President Alan R. Hawley and Gov. Henry Woodhouse of the Aero Club of America.

He has also been Washington correspondent of AERIAL AGE and *Flying*.

Before coming to Washington in 1913, Capt. Smith had been city editor of the Manila Cable News-American and editor of the Far Eastern Bureau in New York City. He is a member of the National Press Club, Aero Club of America, American Geographical Society and other organizations.

Aeroplanes May Reveal Secrets of the Artic

The aeroplane will be used in future explorations of the Artic regions, and the Crocker Land expedition is the last one to depend on dog sledges, according to Donald B. MacMillan, the leader of the expedition, who returned to New York recently.

His party made the first maps of North Cornwall Island and Findlay Land, and mapped the region from Cape Sabine to Clarence Head and the west coast of Ellesmere Land. They have brought back records left by explorers as early as 1853.

"When I started on the expedition the aeroplane was yet an imperfect instrument," said Mr. MacMillan, "but with the progress that has been made during the last four years, and the long sustained flights that can be made now, I am sure that the aeroplane will be wonderful for explorations in the Artic. There are long stretches of smooth, level ice on which aeroplanes could land, and stretches of free water on which seaplanes could make a landing. A very good average now with dog sledges is twenty miles a day. Think of what a difference in this and the progress that could be made with an aeroplane.

"Fuel stations could be established from which the aeroplanes could make their flights and get supplies. I think, as far as oils and materials are concerned, the climate would not trouble one. The summer would be the time for such an expedition, and then, in a short time, much of that for which we have spent years of exploring could be settled. We have had no trouble with our motor in the summer at all, and an aeroplane could make the trip in summer and be back in September. There are at least 1,000 miles of coast line still to be delineated, and observations could be made from an aeroplane, and as much accomplished in a few months as is now done in more than a year."

Carrier Pigeons Wanted at Front

Major General Pershing, commanding the American army in France, has asked for thousands of carrier pigeons to assist the American aeroplane observers in sending their reports and maps of German positions back to headquarters. Acting upon his recommendation, the War Department is preparing to take a census of the carrier pigeons of the country preparatory to sending great numbers of them abroad.

For hundreds of years certain breeds of pigeons have been recognized as the best carriers of messages in time of war under difficult circumstances. To a great extent they have been outclassed by the wireless, but it now becomes apparent that they still are useful.

All French fortresses have for many years had their pigeon lofts. The employment of these birds with such remarkable homing qualities in connection with aeroplanes, however, is new. It seems that the birds are berd in lofts behind the French lines and trained to return to these lofts. The aviators take them up and when far over the German lines they fasten to their legs any map or report which they desire to return quickly to French headquarters, and the birds almost invariably get back and with great rapidity.

It is said that the French have even succeeded in training pigeons to return to movable lofts which follow the lines of the advancing troops, although, of course, they are not moved far from their original locality.

NAVAL and MILITARY AERONAUTICS

Photographic Division Created

On Aug. 2, the Photographic Division of the Signal Corps was created, and it is understood a number of commissioned reserve officers will be in the field shortly taking official photographs for the Government. The Division is headed by Major James Barnes, U. S. R., who is assisted by Capt. Charles F. Betz, First Lieuts. Edward J. Steichen, Albert K. Dawson and Edwin F. Weigle, all of the Signal Corps, U. S. R.

This Division, organized at the direction of the Chief Signal Officer, will have charge of all matters of photography that at the present has been assigned to the Signal Corps, both in connection with aviation, general photography of military operations, under direction of the General Staff, and the News and Publicity Division.

Major Barnes, who heads this new and important division, is an author, engineer, traveler and war correspondent. He is the son of John S. Barnes, U.S.N., and was born at Annapolis, Md., Sept. 19, 1866. He graduated from Princeton University in 1891, and three years later received the honorary degree of A.M. A part of his career was devoted to civil engineering, especially railroad locating and construction on the Missouri Pacific and the M., K. & T. railroads; but he has achieved greater distinction as a writer and correspondent.

Personnel of Army Aviation School at Atlanta, Ga.

First Lieut. H. H. C. Richards, A. S., S. C., commandant.
H. P. Woods, president of academic board.
Dr. Jackson, post surgeon.
D. S. Elliot, cross country and general flying, signaling and wireless.
R. H. Lowndes, head of department of engines.
P. W. Woodward, head of department of military studies and military assistant to commandant.
J. H. Henika, head of department of theory of flight.
P. C. Bangs, F. F. Merriam, instructors, signaling and wireless.
T. R. Weems, G. N. Weston, instructors, machine guns.
H. H. Durant, instructor.
R. S. Howell, instructor, engines.
C. W. Lytle, instructor, engines, theory of flight.
T. P. Branch, instructor, map reading.
G. H. Boggs, instructor, photography.
L. H. Williams, instructor, signaling and wireless.
B. S. Brown, general office manager.
K. Matheson, orderly for commandant's office.

Columbia Crew Star Joins Aviation Corps

Herbert M. Tichborne, Columbia crew star, is the latest Blue and White athlete to join Uncle Sam's fighting forces. Tichborne is at Ithaca to begin an eight-week training course at the Cornell Aviation School. He received his aviation commission in the army last week.

Two years ago Tichborne rowed No. 7 in the varsity boat at Foughkeepsie, and Coach "Jim" Rice declared him to be one of the best starboard strokes he ever had to work with at Columbia. He also starred on his freshman eight. In addition to his crew activities, Tichborne was a first-class track man, and was adept in the discus and weight-throwing events.

Army Is in Need of Photographers

"The army needs good photographers in all branches of the service, particularly in the Flying and Signal Corps," says First Sergeant "Jack" Price, official photographer in the Aviation Corps. He is stationed at the training camp (Camp Monmouth) of that corps at Little Silver, N. J. The Sergeant-Photographer hopes to be ordered to "Somewhere in France" very soon.

"Men hesitate to apply for enlistment as army photographers because they fear they will have to buy expensive apparatus," he says, "but it is a mistake, for the very best apparatus is supplied to them, and they have every opportunity to do good work, and good work is essential in the army. There is a school of photography at Camp Monmouth. There the men are taught telegraphy also, both with the key and the wireless.

"The work of a photographer in the Signal Corps is as fascinating as it is important. It is most fascinating to take photographs from an aeroplane—and I have flown in Chicago. There's a bird's-eye view for you; it's superb, very different from the view one gets from the top of a tree or a lofty structure or a mountain. Very soon I believe every army observer, whether on land or in the air, must be a photographer. Consider the tremendous service the photographer has rendered to all the warring nations. He creates a visual record of the war, a record which anticipates the historian and outlives the memory, a record which survives the man who made it and perpetuates his name. That is glory enough for any man."

"Jack" Price has been in the newspaper end of the photographic game for twelve years and he has done good work for *The World* and Washington and Minneapolis newspapers and press associations.

Personnel of Army Aviation School at Princeton, N. J.

Capt. Adlai Howard Gilkerson, J. M. A., S. C., commandant.
Gilbert Van Ingen, president of academic board.
First Lieut. Anthony C. Zehnder, M. C. R. C., lecturer, military hygiene.
First Lieut. Kenneth H. Condit, O. R. C., in charge of engines.
Walter Van B. Roberts, M. S. E., in charge of signaling and wireless.
Sergt. (First Class) James E. Carter.
Sergt. (First Class) John W. Cusick, retired, assistant instructor in telegraphy.
Edward Sampson, instructor.

Personnel of the Army Aviation School at University of California

Maj. Arnold N. Krogstad, J. M. A., Signal Corps, commandant, quartermaster, ordnance officer, summary court, president of examining board.
Dr. B. M. Woods, president of academic board.
First Lieut. Bruno F. Sandow, Medical Reserve Corps, post surgeon, member of examining board.
First Lieut. Gerald F. Stoodly, Dental Reserve Corps, dental surgeon.
M. S. E. Herman H. Walker, Signal Corps, retired, clerk, commandant's office.
M. S. E. Milton N. Williams, Signal Corps, retired, acting quartermaster sergeant.
Pvt. Joseph L. Walker, A. S., Signal Corps, assistant instructor in rigging.
Prof. B. F. Raber, associate professor of mechanical engineering and professor of aeronautical engines.
D. J. Conant, professor of aeronautical engines.
Donald B. McFarlane, instructor in gas-engine practice.
F. H. Bachman, instructor in internal-combustion engines.
Collier Raber, mechanic and tool-room keeper.
J. A. Polhemus, instructor in theoretical mechanics.
H. M. Jeffers, instructor in astronomy and meteorology.
W. D. Waterman, instructor in rigging, structure, and care of aeroplane.
R. J. Heffner, instructor in maps and reconnaissance.
E. N. D'Oyly, instructor in artillery observation and use of miniature artillery range.
Dr. L. T. Jones, instructor in physics and professor of machine guns.
F. S. Stockton, G. R. McDonald, and Herbert G. Russell, instructors in machine guns.
R. B. McPherson, instructor in wireless and signaling.
Harold Fielder, instructor in wireless.
E. S. Pillsbury and E. F. Steen, instructors in military tactics, and lecturers.
Clifton R. Gordon, J. C. Moses, and G. G. Mitchell, instructors in military tactics.
F. W. Cozens, instructor in physical education.
Grandison Gardner, instructor.
Guilford McKibben, messenger in office of commandant.
Ruth L. Annis, assistant in office of dean.



Major Whitten J. East, S. C., with the American Expeditionary Forces in France

Personnel of Army Aviation School at Columbus, Ohio

Capt. George E. Stratemeyer, Signal Corps, commandant.
Van C. Walton, secretary of academic board.
First Lieut. Austin H. Seeds, medical officer.
First Lieut. Warner M. Pomerene, Field Artillery.
First Lieut. C. Alfred Campbell.
Sergt. (First Class) Wm. B. Cox, Signal Corps, drill sergeant.
Sergt. Merrill, supply officer (recommended for commission).
Pvt. (First Class) Frank Henry, Signal Corps, assistant instructor in rigging and machine guns.
Charles P. Eich, instructor (recommended for commission).
Wm. T. Magruder, mechanical engineering.
W. A. Knight, shops department.
H. C. Lord, astronomy, meteorology, photography, instruments, theory of flight.
P. A. Brown, wireless telegraphy and signaling.
Kenneth Cottingham, map reading.
Aubrey I. Brown, H. Halouk Fikret, Karl W. Stinson, T. M. Hills, Russell A. Tobin, Louis L. Matson, Wayne M. Holmes, Leo G. Schlegel, Jerry H. Service, John Wesley Prinkey, and Dwight Edward Batesole, instructors.

Signal Corps Appointments and Promotions Announced

The following appointment in the Signal Corps, United States Army, under the provisions of section 2 of the act approved July 24, 1917, to rank from August 8, 1917, is announced:
To be colonel—Raymond C. Bolling.
To be colonels—Charles DeF. Chandler, Edward A. Deeds, and Sidney A. Waldon.
To be lieutenant colonels—Virginius E. Clark, Thomas deW. Milling, Joseph C. Morrow, Jr., Joseph E. Carberry, William H. H. Hutton, Jr.
To be major—Jesse G. Vincent.
To be captain—Albert B. Lambert.
Officers of Av. Sec. S.R.C., to duty as follows: Major H. Fowler to Washington; Capt. J. J. O'Connell to Toronto, Canada, Av. Sec., Signal Corps troops, U. S. A.; 1st Lieut. B. M. Cane to duty at Fort Sam Houston; 1st Lieut. R. W. Schroeder to Aviation School, Rantoul, Ill.; 1st Lieut. W. F. Bull to School of Military Aero-

nautics, Cornell University, Ithaca, N. Y.; 1st Lieut. R. T. Fisher to Fort Sam Houston; Capt. D. L. Roscoe to Toronto, Canada, and assume command of the camp of the Aviation Section, Signal Corps troops, there; 1st Lieut. G. Goldblatt to Toronto, Canada, Av. Sec., Signal Corps troops, U. S. A., for duty. (Aug. 24, War D.)

First Lieuts. Roderick Tower and A. C. Ortmayer, Aviation Section O. R. C., to active duty Rantoul, Ill.

First Lieut. J. M. Tawney, Aviation Section O. R. C., to active duty at school of military aeronautics, Atlanta, Ga.

Master Signal Electrician W. G. Martin, 2d Av. School squadron, S. C. Av. School, to School for Aerial Observers, Fort Sill, Okla. (Aug. 25, War D.)

Signal Corps Regulations

G. O. 112, Aug. 22, 1917, War Dept.

1.—Under the authority contained in Sec. 2 of an act of Congress approved July 24, 1917, the following regulations are prescribed governing the promotion, appointment, detail, or attachment as temporary officers in the Signal Corps, including the Aviation Section thereof, not otherwise provided for by law:

(a) Officers holding commissions in the Regular Army will not be required to undergo further examination as to their moral fitness for temporary appointments in the Signal Corps, including the Aviation Section, but to become eligible for such appointments they shall be required to pass the same examination as to mental and physical fitness now required as a condition precedent to detail of an officer of the Regular Army for duty in the Signal Corps.

(b) All other candidates for temporary appointments to grades not above that of major in the Signal Corps, including the Aviation Section, shall, before appointment, be examined as to their mental, moral and physical fitness in the same manner as now required by regulation for appointments in the Signal Officers' Reserve Corps, including the Aviation Section.

(c) Promotions of temporary officers of the Signal Corps, including the Aviation Section, and the temporary appointment of officers of the Signal Officers' Reserve Corps, including the Aviation Section, to higher grades than that of major shall be subject to such examination as the Chief Signal Officer shall prescribe.

(d) Appointments of persons from civil life to grades of lieutenant colonel and above in the Signal Corps, including the Aviation Section, shall, before appointment, be examnied as to their mental, moral and physical fitness in the same manner as now required by regulation for appointment to the grade of major in the Signal Officers' Reserve Corps (including the Aviation Section), and to such other examination as the Chief Signal Officer may prescribe, provided that officers with rank not above colonel shall be appointed and commissioned by the President alone, and that officers above the grade of colonel shall be appointed by the President by and with the advice and consent of the Senate.



Lieut. Col. Benjamin F. Foulois, who was promoted to Brig. Gen. by President Wilson on July 24th, succeeds Lieut. Col. John B. Bennett, as officer in charge of the Aviation Section Signal Corps

2.—Officers detailed in or attached to the Aviation Section of the Signal Corps may, under provisions of act approved July 24, 1917, when qualified therefor, be rated as junior military aeronauts, but no person shall be so rated until there shall have been issued to him a certificate to the effect that he is qualified for the rating, and no certificate shall be issued to any such person until an examining board, which shall be composed of two officers of experience of the Aviation Section of the Signal Corps and one medical officer, shall have examined such person for rating and shall have reported him to be qualified according to the following requirements:

(a) The presentation of evidence to the board that the candidate has made at least seven voyages in free balloons, each exceeding one hour in duration, one of which must be made by the candidate alone, and one ascension at night of two hours' minimum comprised between the setting and rising of the sun.

(b) Certificate by two qualified balloon pilots to the effect that they have observed the candidate while on free-balloon voyages and consider that the candidate is qualified to pilot free balloons alone.

(c) Practical experience covering a period of at least three months in the care, repair and maneuvering of free and captive balloons.

(d) Evidence that the candidate has had instruction in meterology and its applications to aerial navigation, and the manufacture of gases suitable for balloons, and practical experience in observations from captive balloons.

(e) Examining boards are authorized to take into account practical experience in piloting dirigible balloons in lieu of part of the free and captive balloon experience if such substitution appears to be justified and for the best interests of the military service.

By order of the Secretary of War.

H. L. SCOTT, Major General,
Chief of Staff.

Capt. Robert Marsh, Jr., Av. Sec. S.R.C., to report to C.S.O. of Army for duty. (Aug. 23, War D.)

Capt John J. O'Connell, Av. Sec. S.R.C., to Fairfield, Ohio, for duty. (Aug. 23, War D.)

First Lieut. E. L. Thomas, Av. Sec. S. R. C., to duty at Fort Sam Houston. (Aug. 23, War D.)

First Lieuts. S. M. Clement and R. MacDonald, Av. Sec. S.R.C., to duty in office of C.S.O. of Army in the schools division. (Aug. 23. War D.)

First Lieut. C. J. Nourse, Av. Sec., S.R.S., to report in person to C.S.O. of Army for duty. (Aug. 23, War. D.)

First Lieut. T. S. Knap, Av. Sec. S.R.C., to duty with C.S.O. of Army. (Aug. 23, War D.)

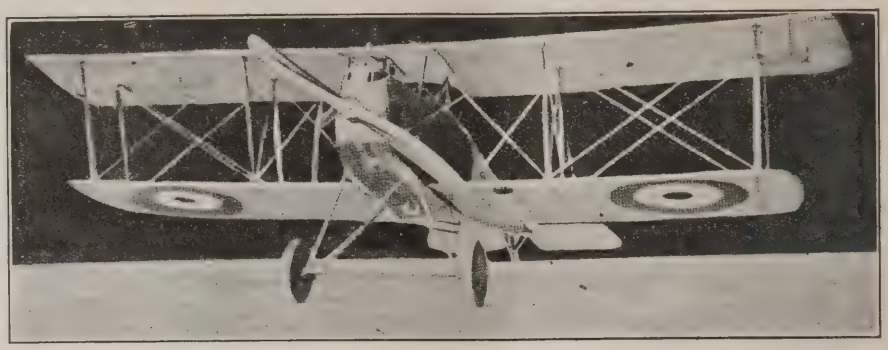
Signal Corps Aviation Camps

Location.	Field.	Squadrons.	Officers	Enlisted men.
Essington, Pa.		1	3	150
Fairfield, Ohio.	Wilbur Wright.	4	12	600
Fort Sill, Okla.		1	3	150
Mineola, Long Island, N. Y.	Hazelhurst	2	6	300
Mount Clemens, Mich.		2	6	300
Rantoul, Ill.	Chanute	2	6	300
San Antonio, Tex.	Camp Kelly.	8	24	1,200
San Diego, Cal.	Rockwell	2	6	300
Total		22	66	3,300



Roll call preparatory to setting up exercises at one of the U. S. Army Aviation Fields

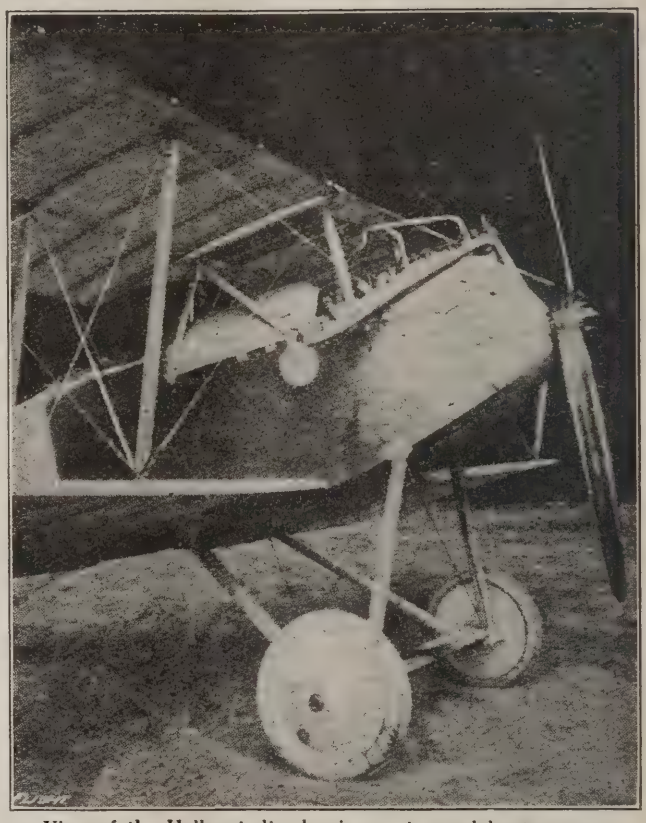
THE GERMAN HALBERSTADT BIPLANE



IN our issue of June 4, 1917, we gave a description and a number of detail sketches of the construction of the German Halberstadt biplane. These, as well as the drawing showing the machine in flight, were prepared from a very incomplete set of parts, most of which were in a hopeless condition, while the whole nose of the machine and large portions of the wings were missing altogether. Nevertheless, by comparing these sketches with an actual complete machine since captured, it was found that all particulars then given were absolutely correct. That this is so may be easily verified by referring back to our June 4th issue and comparing the drawing of the machine in the air with the photographs of a captured machine, which, thanks to the courtesy of the British military authorities, the representative of *Flight* was able to inspect at a British aerodrome. The machine has, it may be noticed, been painted with the British identification marks for purposes of testing it over English soil and thus find out if there is anything particularly valuable in its performance which might be of any use to constructors. Let it be said at once that there does not appear to be any phase of performance or evolution in which this once-upon-a-time much-talked-of machine can hold its own compared with a good British or French machine of the same size and power.

So far as it is possible to gather, the Halberstadt has almost, if not quite, disappeared from the Western Front, which fact indicates that it is no longer a match for our or our Allies modern fighters. The machine which has, more than any other, superseded the Halberstadt is the Albatros single-seater with the Nieuport-type wing bracing. It might be objected that the machine of which we publish photographs this week is of a type that is nearly a year old. This we grant, but to the best of our knowledge there is not in existence—or at any rate not in use—a modern Halberstadt. Whether the reason for this is to be sought in so vastly superior a performance by the other makes of German fighters as to cause the German authorities to concentrate on the production of these, or whether it is due to the Halberstadt in its present form being difficult to alter and improve to such an extent as to bring its performance up to that of the others, is a matter of conjecture. We have heard it said that while the Halberstadts were in use on the Western Front a surprisingly large percentage of those brought down were observed to come to earth in what appeared to our pilots to be a spinning nose-dive.

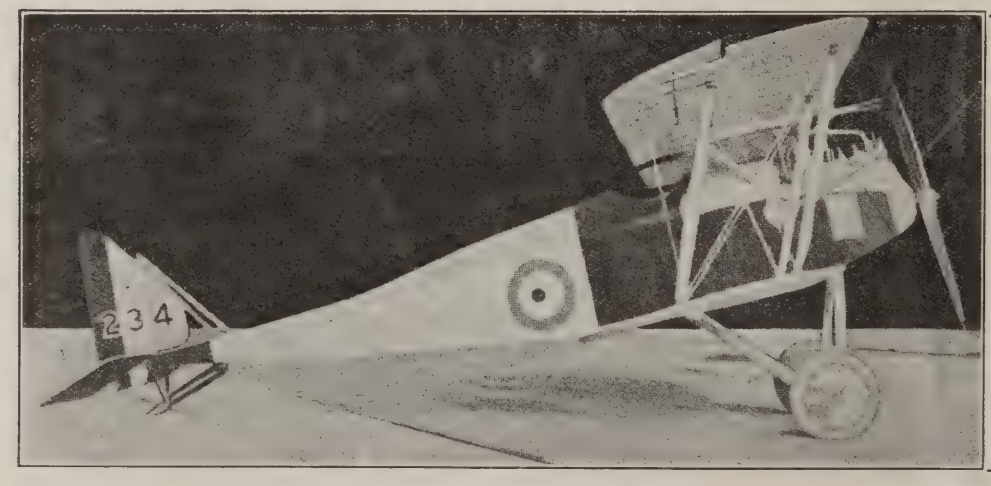
If this be so—and we have heard the same remark made by so many independent observers that there can scarcely be any doubt about the correctness of the statement—it rather looks as if the Halberstadt was inclined towards spiral instability. An examination of the photographs tends to confirm this impression. In the first place, the total absence of any fixed vertical surface in front of the rudder, coupled with the fact that the body terminates in a horizontal knife-edge at the rear, at once makes one suspicious as to the adequacy of vertical surface to the rear of the centre of gravity. To make matters worse the body is very deep in front, the vertical surface here being also slightly augmented by a portion of the large water-cooled engine, although in the present machine this is, as a matter of fact, almost totally covered in.



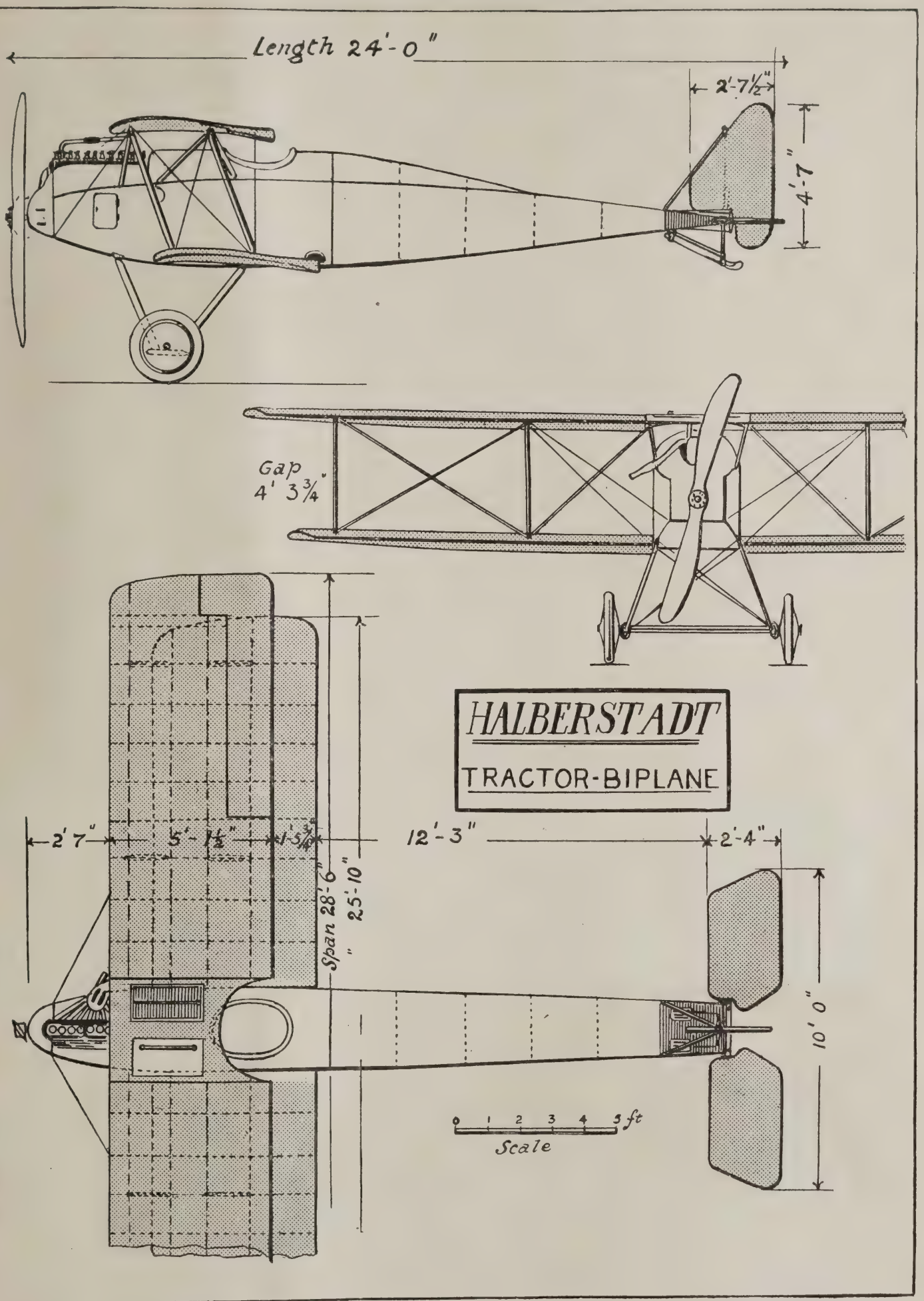
View of the Halberstadt, showing motor and landing gear

As to the possible reasons why the performance should be inferior to that of other machines of similar horsepower:

(*Continued on page 22*)



Side view of the 120 H.P., Argus-motored Halberstadt biplane. The British identification marks were painted on so the machine could be tested over British soil


Length 24'-0"
2'-7½"
4'-7"
Gap
4' 3¾"
HALBERSTADT
TRACTOR-BIPLANE
2' 7"
5'-1½"
1'-5¾"
12'-3"
2'-4"
Span 28'-6"
" 25'-10"
10' 0"
0 1 2 3 4 5 ft
Scale

THE 260 H. P. MERCEDES

THE engine forming the subject of the present notes is the latest type 260 h.p. Mercédès, and the accompanying drawings and details have been collected from an investigation of the twin engines taken from a captured three-seater "Gotha" biplane of the pusher type.

The engine is naturally of considerable size, and in connection with these larger types of enemy aircraft engine, the 260 h. p. Mercédès is typical of German ideas at the moment. It may be regarded as practically a magnified edition of the smaller ones, and much of the detail design is similar. One of the Mercédès engines was obtained little damaged, with the result that after certain repairs had been carried out it was put through a bench test, when particulars as to b.h.p., consumption, etc., were taken.

In many respects and in general constructional detail these engines resemble the 160 h.p. Mercédès, and follow the usual German practice for aircraft engines of this type. Six separate vertical cylinders, water-cooled, with a massive six-throw crankshaft running on plain bearings, are the outstanding characteristics, the design throughout aiming at strength and reliability, combined with ease of manufacture, rather than extremely low weight per b.h.p. Although, of course, of considerable size, the whole engine is of very homogeneous and clean design throughout, as will be seen from the accompanying illustrations. The complete engine, including the propeller boss, measures 6 ft. 5½ in. overall, and from the bottom of the sump to the top of the overhead camshaft casing measures approximately 3 ft. 10 in. The bore of the cylinders is 160 mm. and the stroke 180 mm. Four valves—*i.e.*, two inlet and two exhaust—are arranged in the head of each cylinder, and these are operated by an overhead camshaft running in a separate housing, supported on brackets screwed into the cylinder heads; the valves are interchangeable.

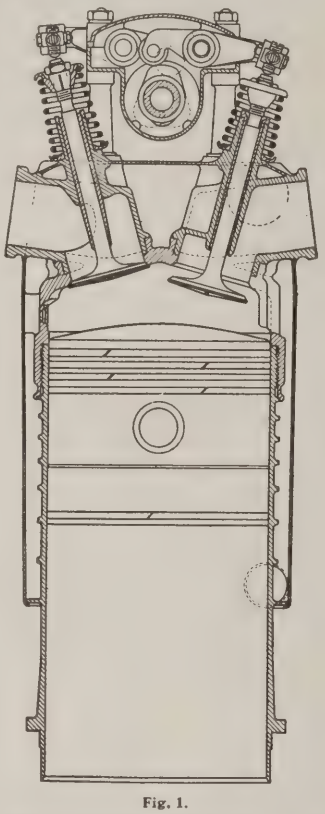


Fig. 1.
Cross section through cylinder and valve gear.

The half compression device is operated by sliding the camshaft in the usual manner, and the arrangement is similar to that adopted on the 160 h.p. Mercédès; the actuating gear is fitted to the rear end of the shaft casing.

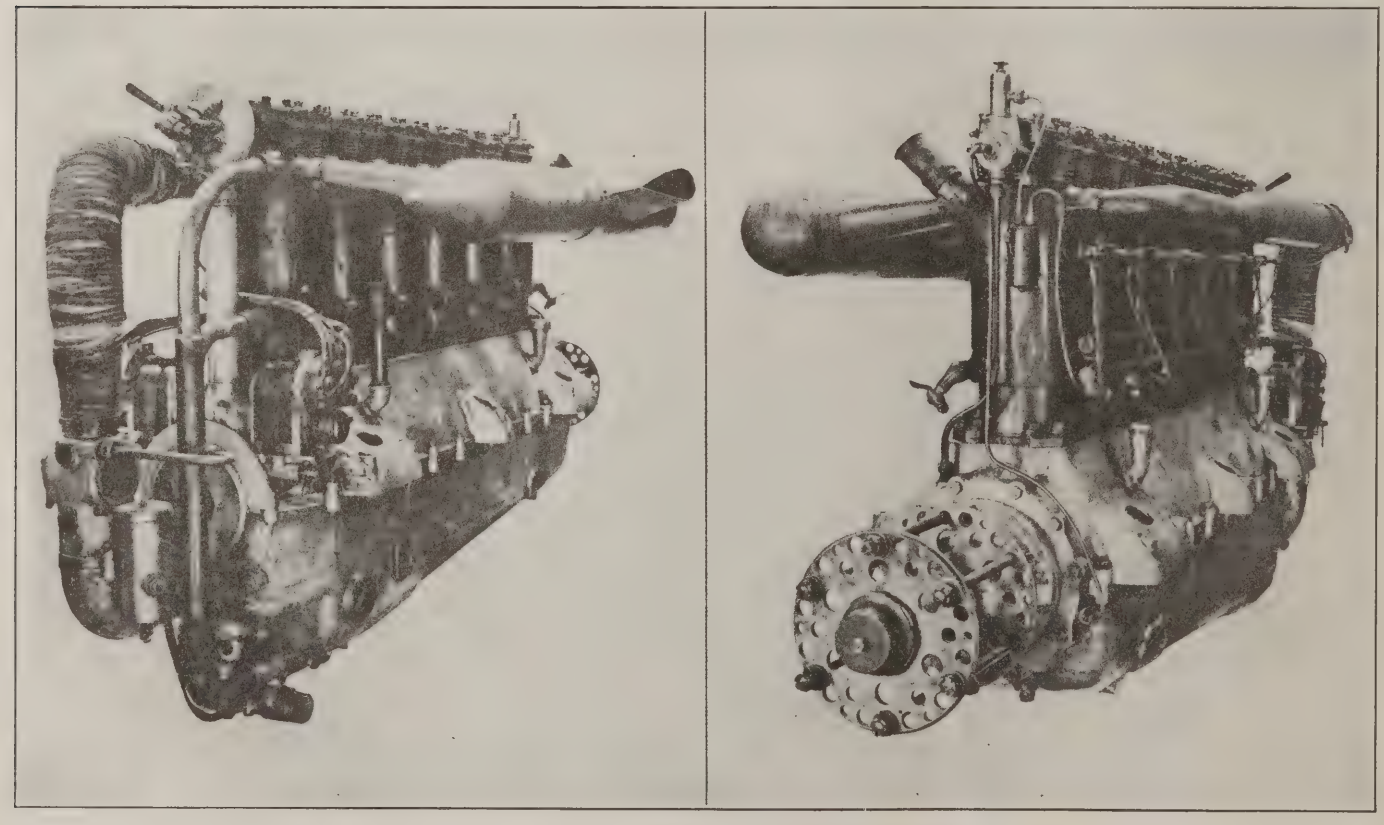
The induction pipe takes its air supply through the base chamber, to the rear end of which it is attached, and a 4 in. diameter passage is cast in the base for this purpose. A simple type of two-jet carburetor is employed.

The main bearing caps are cast integral with the bottom half of the crank case, and the long bolts that secure them pass through the top half of the crank case, and are used for securing the cylinders by means of triangular clamps.

Forced lubrication is, of course, employed, the bearings and journals being supplied through the drilled crankshaft and suitable oilways. A four-throw eccentric-driven plunger pump of similar but improved design to that used on the 160 h.p. Mercédès type is fitted. An "auxiliary" sump in the front end of the crank case is embodied, and small supplementary pump plungers, which work in conjunction with the main oil pump, feed fresh oil into the system from the service oil tank. Full particulars of the lubrication system and the somewhat complicated oil pump are given, with other details of the engine, in the pages that follow.

Two Bosch Z.H.6 magnetos are fitted, and these are driven off the vertical camshaft driving spindle. The spark plugs are fitted, of course, on the induction side of the cylinders.

The water pump driving spindle is lubricated whilst in flight by means of a ratchet-driven grease gun or pump, worked by a cable and lever from the pilot's seat. An electrical tachometer is



Front and rear end of the 260 H.P. Mercedes aircraft engine

driven at engine speed from the rear end of the camshaft through a flexible shaft.

At the opposite end of the engine to the half compression actuating gear a small direct-driven plunger pump is fitted for providing air pressure to the fuel tank, while just beneath, and attached to one of the pipes, a trap is fixed to prevent oil, which returns to the sump via the oil pump casing, getting into the air pressure supply. A spindle beneath, and on the same centre line as the vertical camshaft driving spindle, drives the water pump, which is arranged with a plain dog coupling, so that it may be easily withdrawn should this become necessary for any purpose.

A feature in the construction of these engines is the general use of soft mild steel for such parts as the lubrication pipes, etc. This feature may lead to the fallacious conclusion that the enemy has adopted mild steel owing to shortage of copper, whereas this practice has been standard with the Mercédès Co. for many years—certainly since long before the war.

Such is the general layout of the engine; the following are the more intimate details.

Cylinders

The general construction of the built-up cylinders, composed entirely of steel machined all over, and sheet steel pressed to the formation of the water jackets, presents an interesting example of expert acetylene welding. The building-up methods applied to the cylinders and their general construction are clearly shown in fig. 1. The cylinder barrels are screwed into the cylinder head, the pitch of the thread being 1.75 mm. They are machined from forgings or billets, and the cylinder walls taper in section from 3.5 mm. at the top to 6 mm. at the holding-down or base flange. Six stiffening ribs are arranged, the distance between the ribs increasing towards the base of the cylinder. The barrels extend 35 mm. below the base flanges, and are of 3 mm. thickness for the depth of 12 mm. forming the register, the extension being then reduced to 2.75 mm., presumably as register clearance and to reduce the amount of limit machining.

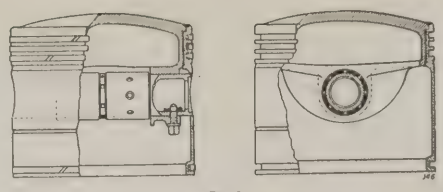


Fig. 2.
Arrangement of piston, gudgeon pin, and bush.

Steel forgings are employed for the cylinder heads, and into these are built the four valve pockets and also the inlet and exhaust ports. The seatings for the valves are machined in the cylinder heads, and the thickness of the crown of the heads is 11 mm. The valve pockets are also machined from steel forgings, and are acetylene-welded into the cylinder heads. Steel valve stem guides are welded into the valve pockets, and phosphor bronze bushes are pressed into the guides. It will be noticed that the exhaust valve guide is arranged with greater water space than the inlet.

The water jackets are built up in four sections from sheet steel pressings 1.25 mm. in thickness, the lower section of the jacket being of barrel formation and welded to the flange joint on the cylinder walls. The top sections are in halves and encircle the valve pockets, the joints being welded vertically on the centre line of the valve ports. A sheet steel disc is welded on to the flanged top sections to form the top of the jacket, and the water circulation pipe connections are welded into the top and bottom of the jackets on the exhaust side. The spark plug bosses are fitted and welded into the cylinder barrels on the induction side just below the inlet valves.

As in the 160 h.p. Mercédès engines, the exhaust valve guides are water-cooled by recesses formed in each of the exhaust valve pockets, so that the water is led right up to the valve stem guides. Considering the size of the cylinders, they are remarkably light in weight. The complete cylinder, with valves and valve springs, etc., and including the two brackets screwed into the cylinder head to carry the camshaft, weighs 34.25 lbs.

Pistons

These are constructed in two parts —namely, the head which carries the gudgeon pin and the skirt of the piston into which the head is screwed. A steel forging machined all over forms the head, the thickness of the crown being 8.5 mm.; it is slightly domed, as shown in fig. 2. The skirt of the piston is screwed on to the head and acetylene welded at the joint, cast iron being used for this portion. Three compression rings are fitted in grooves in the cast iron skirt above the gudgeon pin, while a scraper ring is fitted at the base of the piston. The width of the rings is 5 mm., and all the rings are split with a simple diagonal gap cup at 45°; no locating pegs are fitted to maintain their positions. The gudgeon pin, which is 37 mm. diameter, projects through the bosses in the piston head and fits into the piston skirt flush with the outside diameter. It is fixed by an 8 mm. set-screw, passing into the end of the gudgeon pin and through the boss, being locked by a split pin on the inside. The weight of the complete piston with gudgeon pin and bush is 11 lbs.

Valves and Valve Gear

As previously mentioned, the twin inlet and exhaust valves are interchangeable, the maximum diameter of the head of all valves being 60 mm., while the port diameter is 55.25 mm. The lift of both the inlet and exhaust valves is 10 mm., and the clearance between the end of valve stem and adjustment screw of the rocker arm is .018 in. The general arrangement of the valves and rocker arms is clearly shown in fig. 3.

The valves are operated by a single overhead camshaft, enclosed in a housing of special alloy machined all over. It is supported on T brackets on the cylinder head, two to each cylinder. The camshaft runs on seven phosphor bronze plain bearings, which are mounted in aluminum bushes fitted into the camshaft housing and located by a tapered grub-screw.

The method of operating the twin valves off one cam and the general design of the camshaft and camshaft housing are interesting; details of this arrangement are also shown in fig. 3. The spindle of each rocking lever is mounted on three bearings in the camshaft housing, and is so designed that the cam operates the arm of the rocking lever inside the camshaft housing, whilst the other arm of the rocker operates the valve outside the casing, this arm working between two outer bearings of the rocker spindle situated between the separated compartments of the camshaft casing. On the end of

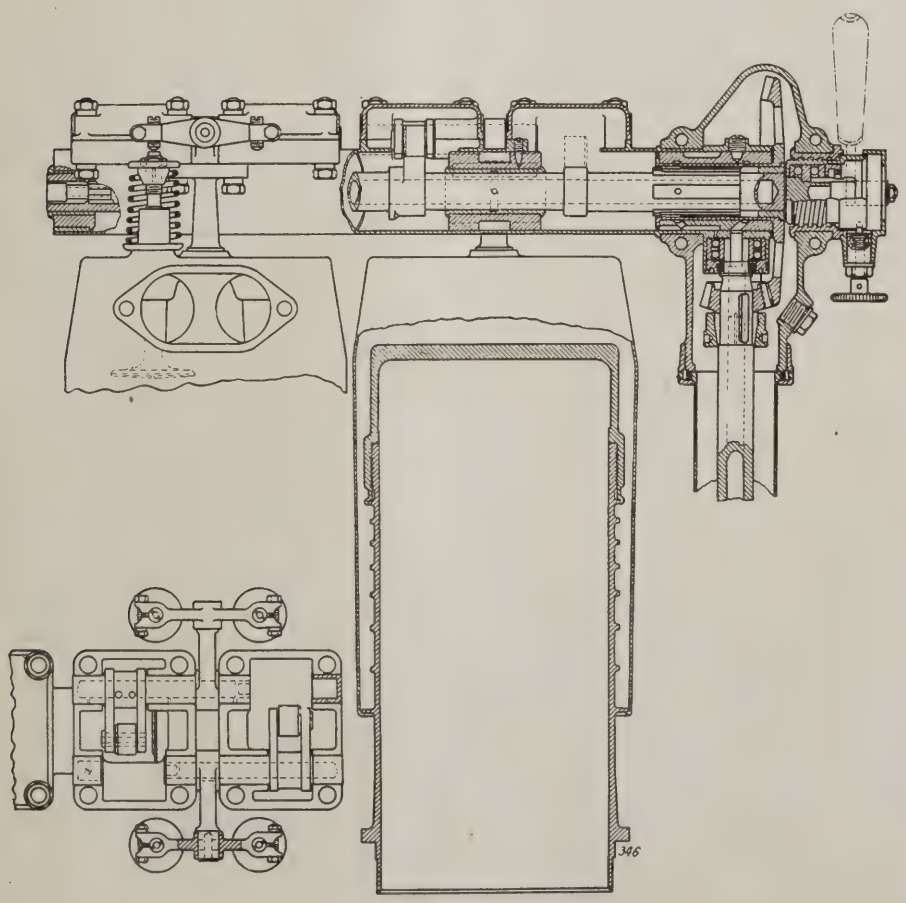


Fig. 3.
Arrangement of camshaft and half compression gear.

the outer rocker arm a double branch tappet arm is fixed which operates the twin valves. (See Figs. 4 and 5.) Although these branch arms should not move upon the valve rocker, they are not secured by a set-screw or taper pin; being merely pressed on to the ends of the rocker arm, they are easily driven off, and probably are so arranged in order that they may automatically equalize any variation in valve stem length that develops in work. The spindles of the valve rockers are carried directly in the camshaft housing, no gunmetal or other bushes being fitted. The inner arms of the rocker levers in contact with the cams are fitted with hardened steel rollers.

The diameter of the valve stems is 11 mm., and each valve works in a phosphor bronze bush in the valve stem guide, as already mentioned. All valves are set at an angle of 15° to the cylinder centre line, and single helical valve springs are fitted. They measure 39 mm. at the base of the coil and taper to 31 mm. at the top. Conical split nuts, locked by the pressure of the valve spring on its washer, locate the springs on the valve stems; details of this arrangement are shown in the illustrations.

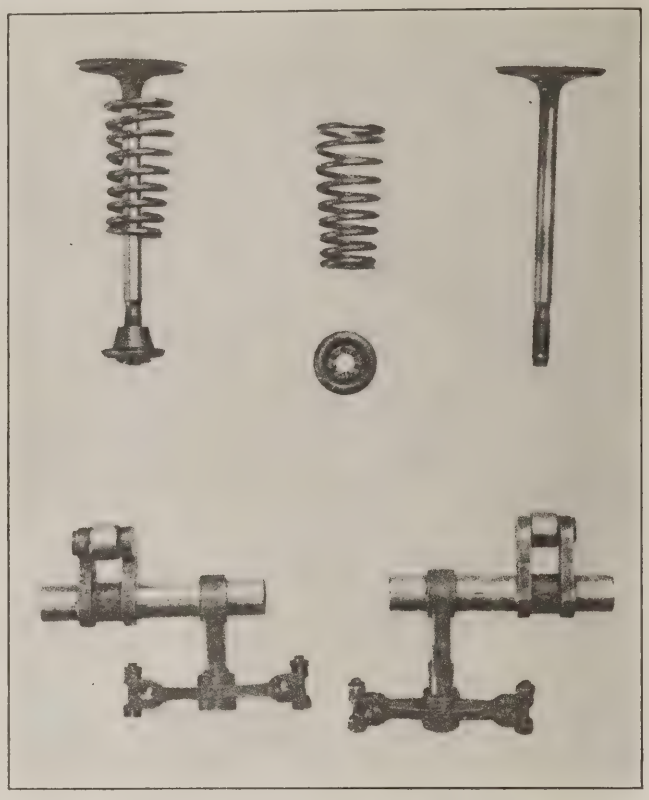


Figure 4—Valves and valve rocker arms

Camshaft Drive and Half Compression Gear

The camshaft, as previously mentioned, is driven through a vertical shaft by the main distribution bevel pinion mounted on the end of the crankshaft by four splines. The method of attaching the bevel pinion to the top end of the vertical driving spindle is interesting. The fixing of this pinion is so designed that it may be adjusted for mesh in relation to the teeth of the camshaft-driven bevel wheel. Details of this gear and its fixing arrangement are shown in fig. 6. The end of the shaft is 23 mm. in diameter and ground parallel; it is fitted with a key, and on this the bevel pinion is a push fit. A ground extension sleeve, tapered and screwed as shown in fig. 6, is arranged on the bottom of the pinion, this sleeve being split by four saw-cuts, so that the application of the screwed collar closes in the slots and so locks the bevel on the shaft.

Half Compression Gear

This is similar in design to that fitted on the 160 h.p. Mercédès engines, in which the camshaft is designed to slide longitudinally in its bearings and bring into operation a small cam situated on the mid-neutral axis of the exhaust cam proper. Sliding movement of the camshaft in its bearings is provided by arranging the camshaft driving bevel wheel upon castellations on the end of the camshaft. The camshaft driving wheel is mounted in a split gun-metal bearing in the rear end of the camshaft housing, and the sliding movement of the camshaft is effected by means of a hand lever set at right angles to the axis of the camshaft, and to which is attached a gunmetal collar screwed inside with a five start square thread of 23 mm. pitch. This collar, which is located in an aluminum housing, engages with a corresponding screw thread cut on the outer diameter of a steel sleeve. Inside the sleeve is a double ball thrust, which is fixed to the rear end of the camshaft, so that in operation the movement of the half compression lever about the axis of the camshaft rotates the quick thread screw in the sleeve, thus pulling or pushing the end of the camshaft in its bearings through the castellations of the camshaft driving bevel wheel. When the camshaft is drawn to its limit of movement towards the rear, the half compression cam is drawn into line with the roller end of the exhaust valve rocker arm, giving the requisite lift to the exhaust valves. The half compression cam opens the exhaust valve near the end of the compression stroke.

The hardened steel rollers on the cam rocker arms are chamfered off at 45° on one side to allow of easy enagement of the half compression cam, which is also chamfered at 45°. The gear is clearly illustrated in the drawing of the rear end of the camshaft driving gear.

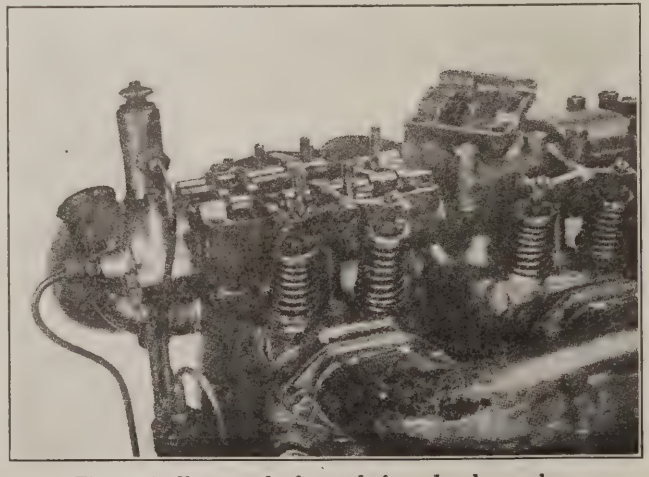


Figure 5—Front end of camshaft and valve rockers

Connecting Rods

These are of normal design and consist of H-section forgings. They measure 326 mm. between centres, and the total weight of the complete connecting rod, including the small end bush, is 7 lbs. The weight of the big end complete is 4 lbs. 14 ozs., and the weight of the small end 2 lbs. 2 ozs. The thickness of the centre web of the H-section is 2.5 mm., while that of the two flanges is 3.5 mm. The diameter of the big end bearings is 64 mm. and the length 80 mm. These are split in the usual manner and held by four 12 mm. bolts.

The distinctive feature of the connecting rods is the floating gudgeon pin bush, the design of which is similar to that used on the 160 h.p. Mercédès. The bush is of hardened steel, ground 2.5 mm. in thickness, the outside diameter being 42 mm. and the inner diameter is 37 mm. The bush is a running fit in the small end and also on the gudgeon pin, and is pierced by fourteen 5 mm. holes in the same manner as that adopted upon the floating sleeves of commercial vehicle road wheels. Oil is supplied by a 6 mm. pipe leading upwards from the big end bearign. The

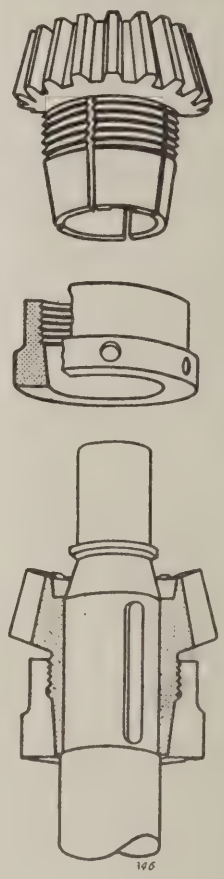


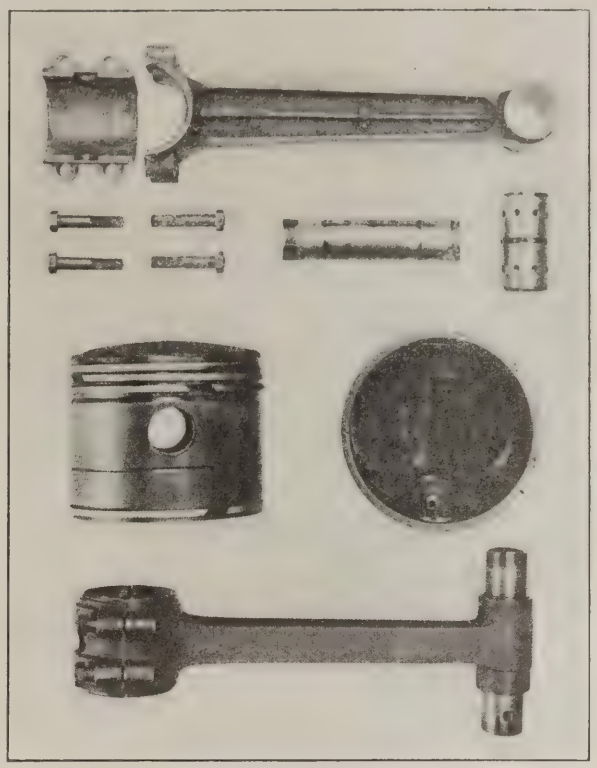
Fig. 6.
Camshaft driving pinion.

pipe is of soft mild steel, and attached to the web of the connecting rod by two riveted clips. Details of the connecting rods and floating gudgeon pin bush are shown in Figs. 7 and 8.

Crankshaft

The six-throw crankshaft, which is of very massive design, weighs 139.5 lbs., including the propeller boss. The cranks are set at 120°, and the diameter of both the crank pins and journals is 64 mm. The length of the front journal bearing next to the propeller is 104 mm., and the length of all the other crankshaft bearings is 64 mm. The thickness and the width of the crank webs increases towards the front end of the crankshaft, so that the thickness of the front web is 29 mm., that of the second 28 mm., whilst the remainder are all 27 mm. in thickness.

The crankshaft is hollow, and the webs are drilled for the passage of oil from the journals to the crank pins for lubricating the big end bearings in the usual manner. The holes bored in the journals and crank pins for lightening purposes are of decreasing diameters, as follows:



Connecting rod, piston, gudgeon pin and bush

Internal Diameter of Hollow Crankshaft Journals.

	1.	2.	3.	4.	5.	6.
Prop end						
Oil pump	32 mm.	33 mm.	35 mm.	38 mm.	40 mm.	41 mm.

Internal Diameter of Hollow Crank Pins.

	1.	2.	3.	4.	5.	6.
Prop end						
Oil pump	35 mm.	35 mm.	35 mm.	38 mm.	40 mm.	41 mm.

The ends of the hollow journals and crank pins are plugged with sheet steel caps, which are driven into the cranks and then expanded into an annular groove cut on the inside.

To take the propeller thrust a ball thrust washer 110 mm. diameter is provided on the front end of the front journal bearing. It is mounted in a split cage, which is held in the housing of the crank case halves. The propeller boss is mounted on a taper on the crankshaft, and a single key, 120 mm. long and 13 mm. wide, is sunk in the crankshaft parallel to the taper.

The front flange and the boss are arranged with six shallow castellations, each 29 mm. wide, and the propeller is clamped by six 18 mm. bolts on a 230 mm. diameter pitch circle. The propeller boss and the front flange are both locked on the shaft by the usual Mercédès locking device, as shown in the drawings of the boss, fig. 9.

Crank Case

The very clean design of the crank case is evident from the illustrations, and, furthermore, it is of very light section considering the size of the engine, the average thickness of the walls of the casing being 6 mm. The top and bottom halves are bolted together in the usual way by twenty-six 10 mm. hollow bolts through the flange on the centre level of the crankshaft.

As already mentioned, the crankshaft main bearing caps are cast as part of the bottom half of the crank chamber, and the long 20 mm. bolts which secure the bearings caps at the bottom pass through the top half of the crank case and act as the holding-down bolts for the cylinders, which are held in position by triangular bridge clamps. The bottom ends of the cylinder barrels extend past the base flanges, registering into the top of the crank case, and the holding-down bolts clamp each cylinder base flange at four points by the bridge pieces, or dogs, arranged between each pair of cylinders.

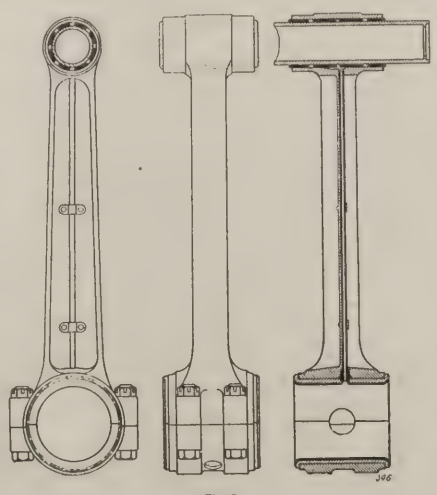


Fig. 7.
Connecting rod.

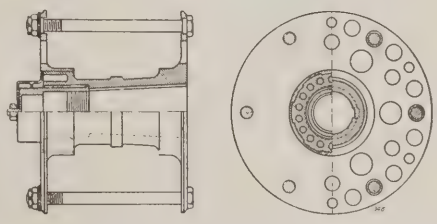


Fig. 9.
Arrangement of propeller boss.

Below the crank chamber at the rear end is situated the main oil sump, which contains the oil pump, and in the front end of the base chamber casting below the false bottom is an auxiliary service oil sump, into which the return oil from the circulation system drains through a wire gauze filter.

The central portion of the base chamber casting, between the two sumps, forms an air chamber for the dual purpose of cooling the oil and warming the air supplied to the intake of the carburetor. Exterior air is led by two ventilating funnels on each side of the crank case into two oval ports in the base chamber casting, and a number of fins are cast on the underside of the false bottom inside the base chamber for cooling purposes.

The air intake to the carburetor is 4 in. in diameter, and it is cast in the left-hand side of the crank chamber and base, as shown in the general arrangement drawings of the engine. Cooling fins are also cast on the underside of the sump, and four breathers are fitted into the top half of the crank chamber between the webs of the main bearing housings.

(To be continued)

THE USE OF A VIBROMETER IN TRUING UP PLANES

By CARLO MAURILIO LERICI, Turin, Italy

WITHIN the last few months I have adopted successfully a new method of truing up planes, and since the results are truly interesting I am sending them for publication in AERIAL AGE.

This method, available to everyone, consists of using resonance phenomenae for measuring the tension of cables. I use a "Vibrometer" or "Vibratory tensionmeter" consisting of a series of small steel blades (see figure) held fast at one of their ends. The different lengths have a relation with the period of vibration which is characteristic of each blade. (This principle is analogous to that used in certain frequency meters for alternating currents.) When the base of the vibrometer is placed in light contact with a cable which has been caused to vibrate, the blade whose period is closest to that of the cable will soon acquire a very perceptible vibratory motion.

It is known that for a given cable subjected to a tension T, the frequency of the fundamental vibration depends upon the tension according to the formula:

$$t = \frac{l}{n} = 2l\sqrt{\frac{p}{Tg}}$$

t = period of oscillation
n = frequency
l = length of wire
p = weight of wire per unit length
g = acceleration of gravity

or in general we have the relation:

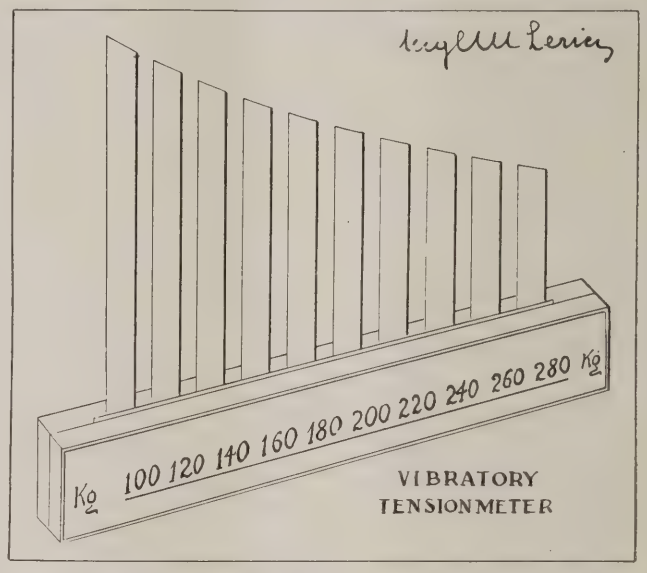
$$T = \frac{4\,l^2\,p\,n^2}{g} = K\,n^2$$

The vibrometer gives directly the value of n. K is a constant for each wire. From the foregoing it will be seen how readily this method may be employed to measure the tension of wires in an aeroplane.

I have noted that for truing up all the modern biplanes, including the most recent 1917 types, the series of blades whose frequency lie between 20 and 40 is sufficient. The error of these measurements is about 4%, this error being caused by the turnbuckle.

The use of such a tensionmeter in the static tests of some new types of planes has enabled me to follow from the start the distribution of tensions in all the cables, and to discover all phenomena or dissymetry, etc., which the analysis had not foreseen. It has also been possible for me to detect all members whose normal period under load is equal to or a multiple of that of the motor, and which consequently might vibrate in flight.

If a single vibrometer is used for truing up an entire aeroplane it is best to number the blades and to indicate the wires and cables which must vibrate in resonance with each blade.



The German Halberstadt Biplane

(*Continued from page* 16)

The body does not impress one as being of particularly good form for low resistance. This is probably chiefly due to the peculiar way in which the turtle back deck is finished off abruptly at a point approximately half-way between the pilot and the tail. The break in the curve of the top covering is very pronounced at this point, and where high speeds are concerned little things like this soon begin to add up and increase the resistance.

In regard to the wings, the first impression one receives is that the strutting and wiring is somewhat clumsy, two pairs of interplane struts on each side being scarcely deemed necessary —at any rate, by British and French designers—in a machine of only some 28 ft. span. Again, the wing section gave *Flights* representative, from a superficial inspection it is true, the impression of being very deeply cambered for a fast machine, although, without knowing the exact shape of the section and being able to compare it with known sections, it is not possible to pass judgment on this point. It does not, as well-known wing sections have shown, follow that a deeply cambered section may not have a very excellent L/D ratio as well as a good lift coefficient.

As the Halberstadt has already been described and illustrated with regard to its constructional details, there does not appear to be any reason for elaborating these here. Since, however, the front part of the machine previously described was missing, a few words concerning this part may be of interest. The engine, a 120 h.p. Argus, is, as will be seen from the illustrations, almost totally hidden inside the body, only the top of the cylinders with their valve stems and springs projecting. The exhaust pipes are of a curious formation, looking somewhat like the weirdly shaped freak carrots sometimes deemed worthy of an illustration in the Press. As to the purpose of this writhing mass of tubes, this is not instantly apparent to the uninitiated, one pipe from each cylinder joining one from another, the resultant pipe joining further along its course up with similar ones, the whole to finish in a single outlet to the air.

The only other feature of the Halberstadt biplane that is of any particular interest is the radiator, which is, as will be seen, mounted in the centre section of the top plane, to the curvature of which it conforms. Certainly this arrangement should make for reduced head resistance, and it may be taken for granted that it has been found in practice to give adequate cooling. That its position is such that, should it be pierced by a bullet, the hot water can hardly fail to give the pilot a liberal sprinkling, may be disconcerting to the pilot, but it is interesting from an aerodynamical point of view.

As Thick As Flees When We Get Ready to Turn 'Em Loose



Courtesy Tacoma Leader



MILITARY AEROSTATICS



SOME POINTS IN AIRSHIP ENGINEERING

By E. T. WILLOWS

(*Continued from page* 978)

Gas Expansions.

Before leaving this matter of the gas bags, it would be as well perhaps to make it clear why it is necessary to allow for such an amount of expansion of the gas. This is due to the decrease of atmospheric pressure as the height from the earth's surface becomes greater.

The earth is surrounded by a layer of air some miles in height, and, consequently, every point upon the earth's surface has to support a column of air. Few people seem to realise that air has weight. The human system is built to withstand the pressure of the air in which we move, so we do not feel it. The average pressure at sea level on every square inch of surface is 15 lbs., due to the weight of the column of air above it. This weight, and, consequently, the pressure, becomes less as the height from the earth becomes greater, therefore, when a balloon is filled at sea level, the gas has to displace air at a pressure of 15 lbs. per square inch, so that the bag which holds the gas is subjected to a pressure of 15 lbs. per square inch, which it merely transmits to the gas inside.

As the balloon rises and the air pressure on its surface becomes less the gas immediately expands and reaches a point at which, if the balloon starts in a flabby condition, the bag becomes full. Under these conditions the airship must limit its altitude to the point at which its envelopes, or ballonets as they are more commonly called in rigids, become full, otherwise there would be a loss of gas taking place through the automatic valves releasing the interior pressure, which would otherwise eventually reach a point at which the "bags" would be in danger of bursting.

Airship Controls.

The difficulty of obtaining stability is one little realised by the average reader. A nice cigar-shaped body would seem to the man-in-the-street to be just the shape to maintain a steady course when driven through the air, but somehow it seems to prefer to "yaw" to one side or the other from its true course, and when once this is started it develops a strong tendency to take charge and career along broadside on.

Here is a similar proposition to that of a boat, which is aptly illustrated by the difference in propelling a small skiff with no keel, or one that is flat-bottomed, as against a rowing boat which has a small vertical surface in the form of a keel. In a somewhat similar way flat surfaces, called planes or fins, are attached to the hull of the airship as far back as it is possible to place them, two being placed top and bottom in a vertical position, and one on either side in the horizontal.

There are now single surfaces in the large Zeppelins, and a flap or rudder is attached to each, the vertical ones acting as rudders, and those at the extremities of the horizontal fins are for the purpose of depressing the stern of the airship for ascending or raising the stern to enable the nose of the ship to be pointed down for descending.

In the earlier types of Zeppelins superimposed surfaces were placed on either side of the bows for the purposes of ascending or descending. At moderate speeds surfaces placed on the bows had greater effect, and operated more quickly than those placed on the stern, but as the speed of the airships increased it was found that by depressing and lifting the stern the requisite amount of control necessary for efficient handling has been obtained. Single surfaces for the directional control in both planes seem now to be standard for all types of airships. This form, of course, enables stability to be obtained with less resistance than superimposed planes with their attendant struts and cross-bracing. The use of single surfaces for rudder and elevators also simplifies control.

Propulsion Methods.

Until recently, the Zeppelin designers have placed their propellers, by means of outriggers, on the sides of the hull, and driven them, from the gondolas suspended beneath, by a long shaft and bevel gears. More recently, they appear to have merged part of the system of the Schütte-Lanz, the German wooden example of rigid construction, into their design.

That is, they have retained one set of propellers attached to the sides of the hull, and have placed engines driving a propeller at the stern of the gondola through a reduction gear as in the Schütte-Lanz type.

The original Schütte-Lanz had three gondolas, each containing one engine driving a single propeller. The super-Zeppelins now have a stream-line body, again like the Schütte-Lanz, one large gondola forward containing the navigating controls and switchboards for the bomb-releasing gear, and one engine with its propeller at the after end of the gondola. There are then two gondolas amidships, suspended one on either side of the hull, and each containing one engine driving a propeller as in the forward gondola. The aft gondola is placed in the centre line and contains three engines, two driving the side propellers through shafting, and the third at the stern of this gondola. This arrangement enables the total horse-power to be split up into six separate units, four of these having transmission of the simplest character, so that this should make for great reliability, and as long as there is fuel on board the ship should always be under control, and be able to return to its base.

From the forr'ard gondola, which is more roomy than the others, the ship is controlled. The commander has the steering-wheel in front of him, and a wheel at his side for controlling the elevators. Overhead are wire controls for opening gas valves, and also for opening the valves of the water-ballast bags. He also has at hand a switchboard controlling electrically the gear for releasing bombs.

In a central passage way, or interior keel, in the hull, provision is made for the storage of bombs, petrol tanks, and water-ballast. These weights are evenly distributed along the hull. From this passage way there is a tube passing through the hull to the machine-gun platform on the top, also smaller tubes which serve as ventilation shafts for this passage way.

At the after end of the passage way there is communication to a gun platform placed just behind the top rudder. The modern Zeppelin is plentifully supplied with light armament, as in addition to three machine-guns on top there are six or seven distributed among the gondolas.

These ships do not yet appear to have reached a sufficient size to have provision made for carrying any bullet-proof protection for the gondolas.

The wireless apparatus is placed in the front gondola just behind the control station. Every provision is apparently made for the efficient working of this, as each engine is provided with a dynamo, belt-driven with a fast and loose pulley.

One of the most important departures and improvements in the new Zeppelin design is the wire cable running right through the centre of the hull, and joining up all the wire bracing between the ballonets.

By this means also the ballonets are kept in their places, as at the point at which the cable passes through the wall of the gas bag there is a gas-tight washer threaded on to a rod, so that should one ballonet become deflated, those on either side are to some extent prevented from tending to bulge into the empty compartment.

The impression one gets when seeing the latest design is that a fine passenger ship could be made of this type. With the displacement up to 50 tons, and the motive power divided into half-dozen units, one sees in the present Zeppelin the forerunner of the fast round-the-world airships of the future.

Spherical Balloon Pilot Certificates Issued by the Aero Club of America During the Week of September 3d.

No. 89—Russell E. Collins.
No. 90—Joseph G. Halsey.
No. 91—Charles Conrad.
No. 92—Carl W. Dammann.
No. 93—Walter Roman, Jr.
No. 94—Oscar Roman.
No. 95—Frederic J. Grant.
No. 96—C. J. Schiller.
No. 97—Capt. John A. Paegelow.
No. 98—Maurice R. Smith.
No. 99—M. L. Witherup.
No. 100—Stuart W. Kellogg.
No. 101—Neal Creighton.

These men are members of the Missouri Aeronautical Reserve Corps, St. Louis, Mo., and are now stationed at the United States Balloon School, at Fort Omaha, Nebraska. Ascensions, qualifying them for the Spherical Balloon Pilot Certificate, were made from various points in the States of Missouri, Illinois, Iowa and Nebraska.



Hydrogen trucks at one of the Aerostatic Stations of U. S. Army

FOREIGN NEWS

AUSTRIA

An Austro-Hungarian Admiralty statement issued Sept. 7 tells of the aerial bombardment of Venice. The statement says:

"As a reprisal for repeated attacks of enemy aviators on the open town of Triest, our hydroaeroplanes on the night of the seventh copiously and most successfully dropped bombs on the naval arsenal and military establishments at Venice. Numerous hits were reliably observed. All our aeroplanes returned.

BELGIUM

Queen Elizabeth of Belgium recently made an aeroplane trip over a section of Belgian territory under German control. With King Albert she was inspecting the front in Flanders held by the French troops, and during her stop went to an aviation centre, where for some time she watched the expert airmen perform various feats. Queen Elizabeth then expressed a wish to obtain a glimpse once more of some of the sections of her unfortunate country still in hostile hands. Her wish was gratified, as she was taken on board an aeroplane which with an escort of pursuit areoplanes flew over the enemy lines and above villages occupied by the Germans.

King Albert of Belgium has named Kenneth P. Littauer, of New York City, aviator with the Franco-Belgian squadron, a Knight of the Order of Leopold II. Mr. Littauer, who already had the French War Cross, is the author of a number of poems.

FRANCE

The Germans on Sept. 6 made an aerial attack upon the American hospitals occupied by St. Louis and Harvard contingents, situated in a coast village, killing one officer of the American Army Medical Corps and wounding three others severely, Reuter's correspondent at British Headquarters in France telegraphs.

Two others of the rank and file were killed and sixteen wounded, five of the latter being Americans.

The raids upon the hospitals were deliberate. That the Americans might not forget, the aviators dropped German coins over the camp as souvenirs. These souvenirs were pfenning pieces.

The officer in command of the Harvard Hospital unit, which suffered most, showed one of the coins. The survivors of the raids, indignant and bitter at the display of barbarity in the attack of defenseless hospitals, all declared they believed the German pilots deliberately dropped the coins as "souvenirs" of the visit.

The Vandelaincourt Hospital in the region of Verdun was bombarded again by German aviators for six and a half hours on Sept. 6th. Nineteen persons were killed and twenty-six wounded.

The huts attacked contained only severely wounded men, who were unable to move from their cots.

Faris, Sept. 6.—Lieut. Raoul Lufberry, premier "ace" of the Lafayette Escadrille, brought down his twelfth German plane Tuesday—and would have made his score thirteen that same day if he hadn't run out of ammunition.

Word from the camp of the American fliers brought the details of the American boy's seven fights in two days. On Monday he downed an enemy in a stiff brush—one of five different fights.

Tuesday morning he encountered a German flier and succeeded, after a long fight, in shooting the gunner dead. Then he ran out of ammunition. Sergt. Edwin C. Parsons, of Springfield, came along and finished the German pilot, downing the machine.

Tuesday afternoon Lufberry encountered another adversary and riddled it with his fire. It crashed to earth. Lufberry's own plane was three times pierced by his opponent's fire.

Corporal Everett Buckley, of the Lafayette Escadrille, a resident of Chicago, was killed, September 6, in an attack with a fellow American flier against five German planes.

Buckley was one of the most popular members of the American flying squadron. He was twenty-four years old and was a graduate of the Avord flying school, having only recently attained his ambition to be a member of the Lafayette Escadrille.

GERMANY

The German aerial forces have been made into four principal divisions into which the fliers are now placed roughly as follows:

1. Army squadrillas or "army fliers' division," which are directly under the command of the army chief of aviation, and the work of which consists mainly of expeditions far to the rear of the lines. They are employed for bombardments, night flights and photographic work.

Captured prisoners say that a recently constructed biplane of the Albatross type is vastly superior to anything heretofore used by these squadrillas. It is equipped with a 260 horsepower motor and attains a speed of from 100 to 115 miles an hour. It can rise to an altitude of more than 2,000 yards in nine minutes and carries two machine guns. The machines travel in groups of six or eight.

2. Corps squadrillas or "troop fliers" which are attached to the staff headquarters of the armies and are commanded by captains. These generally remain within the sector to which they are attached and are used in general for reconnoissances, photographing trenches, batteries and making patrol flights.

3. Hunting squadrillas are the main attacking instruments of the German air forces, and for chasing enemy machines which venture over their lines.

On the west front there are about forty of these squadrillas, with about a dozen machines to each. Others in the same category have as their duty the protection of the large German cities that lie within aeroplane flight of the French and English, such as Strasburg, Freiburg, Mullhouse, Friedrichshafen, Stuttgart, Essen, Cologne and Treves. The pilots are chosen from among the best of the German aviators.

4. Battle squadrillas or "flotillas" are under the diection of great headquarters, and shift from army to army to carry out bombardments on military establishments behind the front, as well as upon open towns.

There are from forty to fifty machines in each squadrilla, divided into four or five sections. Each aeroplane is armed with two machine guns and carries bombs weighing from 20 to 100 pounds. Some are said to carry bombs that weigh more than 200 pounds.

While perfecting their service in the air, the Germans have also bettered their anti-aircraft measures and weapons. The 77-millimeter guns have given way to rapid-firing guns of 105 millimeter caliber, and at certain points along the front they use shrapnel guns of 240-millimeter size.

They possess special bullets for the destruction of captive balloons, but in many instances have used them with great cruelty against opponents in aeroplanes. At least one squadrilla captain, a Lieut. Eilers, forbade his men to carry these bullets with them unless they were definitely charged with raiding balloons.

GREAT BRITAIN

London, Sept. 4.—German aeroplanes visited the southeast coast of England on the night of Sept. 3, dropping bombs at various places. The official statement follows:

"Enemy aeroplanes crossed the southeast coast at 11 o'clock last night and dropped bombs at various places. A number of our aeroplanes pursued the enemy."

One person was killed and six were injured by bombs dropped in the aerial raid over East Kent Sunday night, Sept. 2. The official announcement follows:

"Sunday night's raid was carried out by one enemy aeroplane, which bombed Dover shortly after 11 P. M. Seven bombs were dropped. One man was killed and four women and two children were slightly injured."

London.—In the air raid of Sept. 3, 107 persons were killed and 86 wounded at Chatham, it is announced officially.

The victims were mostly men having naval ratings. Six aeroplanes took part in the raid.

The civilian casualties were one killed, six wounded.

London.—Eleven persons were killed and forty-nine injured in the raid on England of Sept. 4. The enemy is reported to have lost only one machine. British losses in the three days' raids now total 119 dead.

The success of the Geman fliers in dashing down upon the coast, wreaking havoc and then departing with nominal losses, has caused another general storm of indignation with its resultant demand for reprisals. Likewise there is insistence from the press that the much heralded offensive of the Allies be launched.

According to the official announcement the attack was made by a large number of craft. The raiders travelled singly or in groups of two or three. There possibly were as many as twenty of them. The operations on the southeast coast lasted from 10:30 P.M. to 2 A.M. At 11:45 the first bombs were dropped in the London district and the bombardment was kept up more than an hour, forty shells falling. Material losses are reported slight. The Teuton machine which was destroyed was brought down in the sea off Sheerness.

Flashing searchlights gave the first warning of the raid. A bright moon was going down, but there was considerable mist. Only at intervals could the enemy be seen. There were three distinct charges upon the metropolitan district, bombs being dropped each time. Some observers claim that an aeroplane was hit at a height of 9,000 feet, but there was little visible effect of the violent activity of the anti-aircraft guns.

The southeast coast apparently was subjected to the attack of many more aeroplanes than was London. The machines flew at great height and dropped many bombs, but reports indicate there was little damage done. Some of the bombs were of the large, heavy type used in the Zeppelin raids. The Exchange Telegraph Company says at least one aerial torpedo was fired at London.

Cambridge, England, Sept. 5.—A large party of American college men has begun a course in training here for the aviation service.

ITALY

Capt. Gabriele d'Annunzio has told friends in Milan that during the battle on the 19th he flew over the Austrian troops and bombed them from a height of only 250 feet.

His aeroplane was hit repeatedly, and on returning to the shed was found to be pierced with 127 holes. The poet himself was slightly wounded in the left arm.

The Italian official statement of Aug. 31 tells of aircraft raids on Tolmino, which apparently is about to fall into General Cadorna's hands. Communication lines on the Carso have also been bombed by Italian fliers.

A delayed Austrian official statement of Aug 29 tells of another Italian air raid on Triest. Victory is claimed in the "eleventh Isonzo battle."

A squadron of thirty Italian aeroplanes carried out a destructive raid on the great Austrian naval base at Pola Sept. 3d. Nine tons of bombs were dropped on the Austrian fleet at anchor in the harbor and also on the military works, causing "destuction and great conflagrations," according to the official statement issued at Rome. All the Italian machines, though exposed to a severe attack by land and air forces of the enemy, returned safely to their bases.

RUSSIA

Forty Teuton aeroplanes during the twenty-four hours of Aug. 30 descended on the various islands in the Gulf of the big Russian Baltic port, throwing bombs promiscuously.

The Teuton air raiders hurled ninety bombs on Russian shipping and harbor fortifications. Russian machines ascended to engage the raiders, finally driving them off. None of the Russian machines was harmed.

SWEDEN

It is reported from Stockholm that a committee has been fromed to arrange for an aeroplane route from Trelleborg, southern Sweden, to Sassnitz, Germany.

It is added that a Stockholm banker has offered 4,000,000 kroner toward the carrying out of the project.

TURKEY

British naval aeroplanes penetrated far inland in Turkish territory Sunday night, Sept. 2d, dropping bombs on the city of Adrianople, about 137 miles northwest of Constantinople, says an official statement. The text reads:

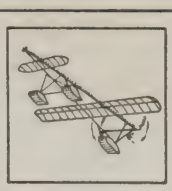
"Naval aeroplanes dropped bombs with good effect on the railway station and bridge at Adrianople, Sunday night."

The main line of the Belgrade-Constantinople railway, part of the "Berlin to Bagdad" route, passes though Adrianople.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th St., New York City

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Ave., Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Illinois Model Aero Club in the War

The Illinois Model Aero Club can feel that it is doing its bit for its country in this great war. First among its members who might be mentioned is E. M. Laird, ex-president of the club, who has now nearly recovered from his injuries received last spring while training aviators for Uncle Sam's service, and expects to get back to work as an instructor just as soon as he possibly can. George E. Weaver, another pioneer member of the club, has but recently completed his training as an eastern naval reserve flying school, and is about to take up his duties as an instructor at an army aviation field. Arthur E. Nealy, another ex-president of the club, after failing because of his eyes in several attempts to enter the aviation section of the officers' reserve corps, has been drafted and is now at Rockford, although he expects to be transferred to the aviation section. J. J. Lucas has also been drafted and will no doubt also try to enter the aviation section. Nor has the Navy been neglected, for Donovan Lathrop, famous for his tractor models, is a first-class machinist's mate in the aviation section of the Great Lakes Naval Training Station. Two other club members, Donald Cornell and Louis Phillis, are now awaiting action on their applications in the aviation section of the Officers' Reserve Corps.

The aviation industry, too, has taken many of our members. First of these stands Chas. Arens, who holds a responsible position with the L. W. F. Engineering Co. Others who have been engaged in this work are Lindsay Hittle, W. H. Hitt, D. W. Pease, Thomas Hall, Ellis Cook, Harry Wells, Donald Cornell, George Lawrence, Donald Ayers, and C. L. Laird.

The Formation of Model Clubs

To those who are desirous of forming new model clubs, perhaps the following information will work out to their advantage. Make or secure several model aeroplanes, any type, and attach to each a fair size display card announcing the formation of a model aeroplane club, with all necessary information concerning its purposes. After this seek permission to display in the windows of stores throughout the city or town as the case may be. Not only will this prove a medium for securing new members but will also serve as an advertising medium for the store in which the models are displayed.

Experiments with Divided Tail Models

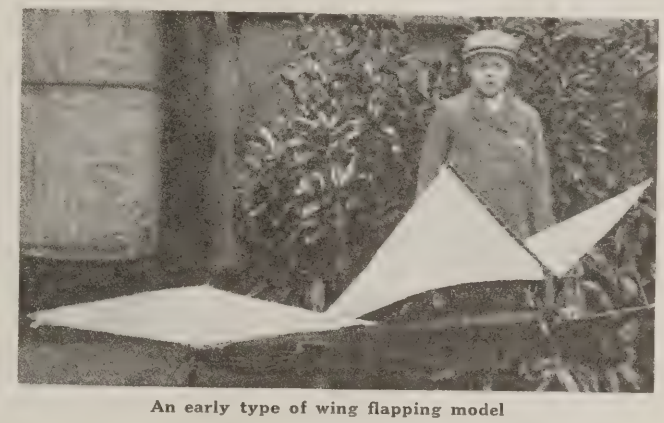
(*Concluded from Page* 980)

In order to properly test this, the tail surfaces were detached and fitted with a forward elevator, the model was flown as a twin canard type, as shown in Fig. 4. It proved an exceedingly inefficient flyer, as demonstrated by amuont of the power required to make her fly.

Keeping this in mind, and reverting back to the previous models, 1 and 2, it was at last decided to do away with the overhanging portions of the main planes, and to increase the tail plane surfaces sufficiently to make the loading of the machine comparatively light.

Thus was evolved Model 4, shown to scale in Fig. 5, and the results were immediately satisfactory, and a decided improvement on the previous machines. Fitted as a twin-propelled model she showed up very well, with good stability and excellent climbing abilities, besides proving a very good wind fighter.

The only thing deemed to need improvement was her rather rakish appearance, which was more pronounced when in the air. In fact this earned for her the rather misplaced name, "The Angry Wasp." She seemed, however, more to suggest a dragon-fly. Another thing introduced into this



An early type of wing flapping model

machine was a small forward vertical surface, which certainly improved the model's flying. To improve her appearance no great alterations had to be made, and Model 5 came into being. The main features of Model 4 were kept in view, and were in fact identical except for a rounding-off of the supporting surface. As experiments for a design of machine suited for fighting (offensive purposes) these tests ended here, but I see no reason why an efficient tractor could not be made incorporating this type.

A Flapping Wing Model

Through the courtesy of *Flight Magazine*, we are enabled to present to our readers some information on early experiment with a wing-flapping model conducted by Mr. John Henry Knight. In writing to *Flight* Mr. Knight states as follows:

I enclose three photos of a flyer with flapping wings I made in spring of 1907. I had previously—in, I think, 1882—made a small model on Mr. Breary's plan, with wings of goldbeater's skin. This is a copy, on a much larger scale. From tip to tip of wings it was 5 ft. 10 ins. by 6 ft. From end to end a series of stretched rubber bands caused a double-throw crank to revolve; these cranks simultaneously worked the flappers. It would fly 16 or 18 yards, but always came down on a fairly even keel, the wings acting as a parachute. Note, in the side view of machine in flight, the curvature of the wings; the rear view shows machine coming down. I regret to see so little mention of Mr. Breary's experiments in about 1882. He showed me some four or five machines, which flew very well.

The flapper appears to have the advantage of coming down comparatively safely. In model experiments with aeroplanes driven by screws, they sometims turn right over, or pitch down on their head. Modern types of aeroplanes have been so successful that, I suppose, nothing will be done with the flapper and its concave wings; it cannot rival the aeroplane in speed, but possibly the parachute action of the wings may render it safer.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

Things We Want To Know

(*To be sung to the air of "An Ode to Tobacco."*)

Why does an aeroplane
Always come down again?
Why cannot it remain
Up where you take it?
If you come down a smack,
Landing upon your back
With a resounding crack,
Why does it break it?

Why does wind ever blow?
Why does snow ever snow?
Why cannot weather go—
Go—well, to blazes?
Why isn't all sky blue?
What ever can one do
When one runs slick into
Thick mists and hazes?

Why can't one hit the sky?
Why does an airman die
When he gets up too high?
Where does he then go? (!)
Why is the air so rough?
Is flying good enough?
What made me write this stuff?
I'm blowed if I know!

E. W. Scott.

Aeronitis Editor:—

Sweet Sir:

I am sending, in response to an urgent call for nonsense, some of the aforesaid material. Hoping this will answer all purposes, I am,

Lovingly yours,

Augustine X. Applesauce.

Interesting Facts

It is reported that in Bukowina the people take off their shoes before going to bed.

It has passed the censors that the King of England stirred his coffee before drinking it.

In Boobania, the men who are not smooth-faced have moustaches and beards.

In Japan, those who do not eat rice partake of other food.

Be gentle to the little hog
Whenever you are able,
For sometimes, slightly mixed with hog,
He's apt to grace your table.

Hors d' Oeuvre

I rarely care to eat my shoes
Or mix cornstarch or pickles with my booze,
Nor yet to munch a salad dressed with rope,
But I confess—I do like soap.

Once I had to find a rhyme for "torpedoed," and I did not come out of it so well as my little friend with "reconnaisance" and "obeisance," to say nothing of "fighter" and "blighter," which speaks of poetic pluck beyond my reach. As a fact, at his age, I am not sure that I dared tackle "reconnaisance" at all, but should have sought relief in something like this:—

Out to take a look around.
(Words to fill up) on the ground.

Now there's genius for you. Come fill up your bumpers, for I am in a right merry mood, and—

Sing hey, sing ho, sing hey for the poet free;
A blithesome chap who cares no rap,
No earthborn son is he.
Sing ho, sing hey, sing ho neath the spreading tree;
This "Dreamer" chap who cares no rap,
No earthly thing can be.



SCENES IN AN AIRCRAFT FACTORY.—XIV.—THE PRESS SHOP.—On the right, a big press is hard at work. The gentleman gauging the plates has apparently burned himself, either through the speed with which he has worked his micrometer, or through holding a hot plate too long. His trouble will shortly be relieved by the assistant overhead with the fire bucket. The elegant press-worker's energy is so great that the charge-hand telling the number of plates delivered has nearly overwhelmed the tally-clerk with her output. Behind the press, a tool-shop hand discovers by the rays of light pouring between a pair of dies that their fit is not all that could be desired. Beyond him again, an assistant carries off the staff's dinner, which has been "hotted-up" in the annealing oven—according to time-honoured custom. The shop cat follows enviously.

In the left foreground, the worker of the big shears has made a clumsy mistake in feeding the machine, and gazes regretfully at his female helper, while his male helper hastens for a surgeon. Meanwhile, the sheet which should have been fed into the shears overwhelms a passing hand. On the extreme left the local butcher's boy removes the remnants of other machinery accidents. [N. B.—German readers are requested to note that we have not yet taken to devouring our casualties, either directly as butcher meat, or indirectly as pig-food, in the German manner. This is only the artist's little joke.—Ed.] Behind him, an energetic wire swager is at work, and in front of him, a worker inspects a friend who has been too closely concerned with a rolling-mill.

29.105
AEA

AERIAL AGE WEEKLY

Vol. 6, No. 2 SEPTEMBER 24, 1917 10 CENTS A COPY



Squadrons of Italian Pomilio Biplanes "Somewhere in Italy"

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The Value of the Liberty Motors

Sturtevant

(REG·U·S·PAT·OFF·)



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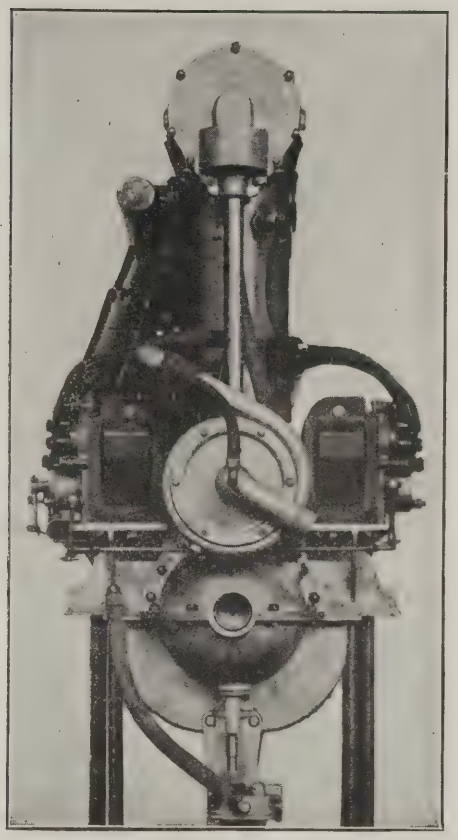
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UNION

120 H. P.

SIX



Extracts from Army and Navy Report

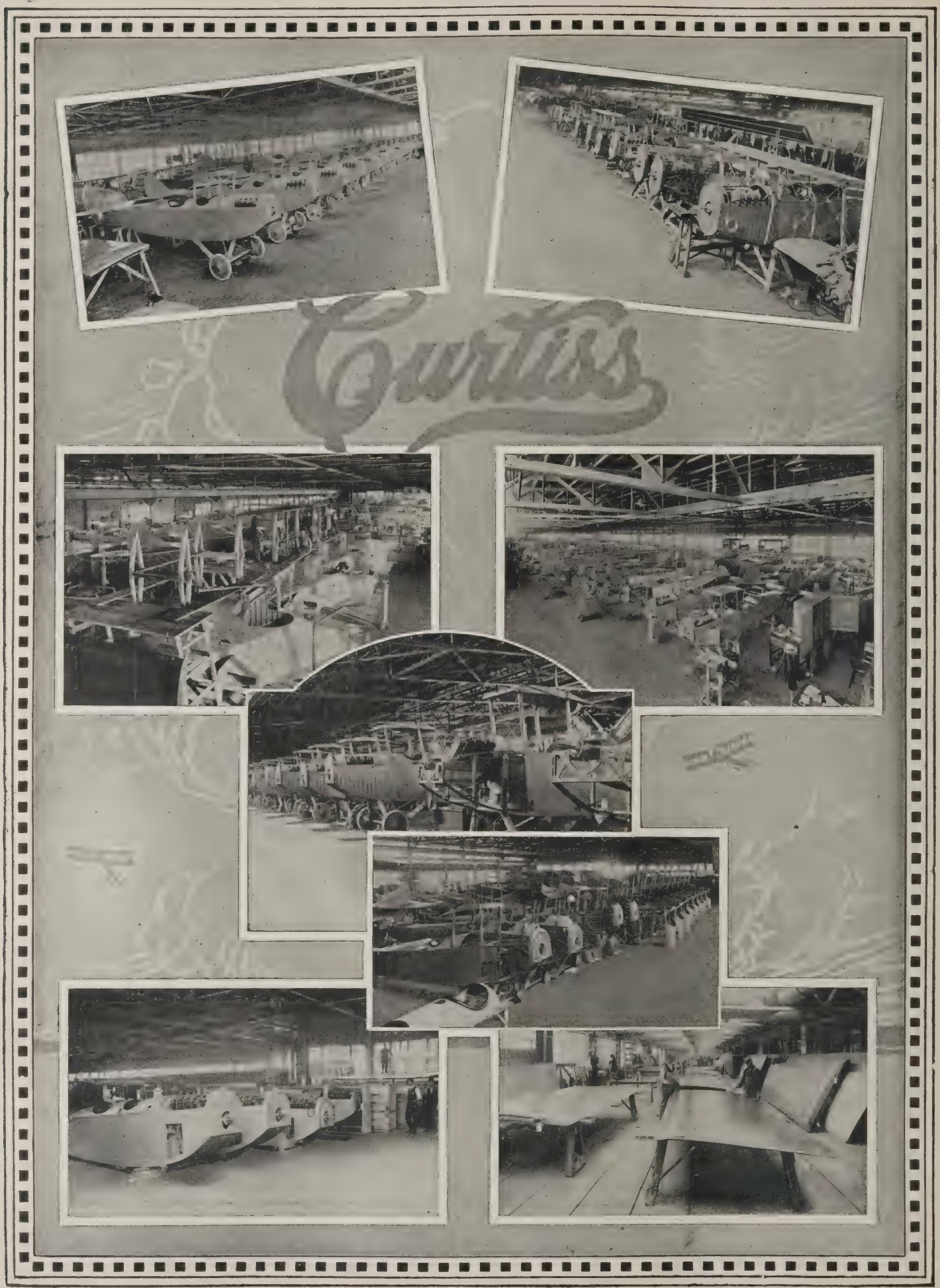
"The engine performed a very satisfactory endurance test. Observations throughout the test showed that the vibrations were low, quick acceleration and good carburetion maintained, also the absence of oil leakage was another good feature as well as no evidence of water leakage at any of the joints."

"The engine demonstrated that its design and construction was such that it would stand endurance test of a much longer duration as when the run was stopped the engine was functioning very satisfactorily."

"The inspection of the engine after the 48-hour endurance test showed the fundamental design to be such that satisfactory service would be given by this power plant. The quality of the workmanship throughout was of a very high order, and also that the very best of material had been used throughout the engine."

UNION GAS ENGINE CO.

Oakland, California



Such photographs as these tell better than words the story of Curtiss progress and manufacturing capabilities

THE CURTISS AEROPLANE CO., Buffalo, N. Y.

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THE VALUE OF THE LIBERTY MOTORS

WE print herewith the official report regarding the Liberty Motors.

Secretary Baker is fully justified in his expression of satisfaction over the achievement. The Aircraft Production Board, the Signal Corps, Messrs. Vincent and Hall, and the engineers who assisted in developing this motor are to be congratulated over this remarkable achievement. Never before, not even in the automobile industry, was there designed, built and tested a motor in such a short time and with such degree of success.

Through this achievement, the Allies will soon be supplied with thousands of motors suitable for almost any type of battleplane. The eight-cylinder motor will probably develop over 250 H.P. when thoroughly tested and tuned up. The twelve-cylinder should—accepting that there will be the usual 50 per cent increase that comes with adding four cylinders—give about 400 H.P.

Being comparatively simple in design, the Liberty motor will permit quantity production to the extent necessary to really enable the United States to supply large quantities to the Allies. Nothing less than ten thousand engines would be large enough to supply several sectors with power plants for their aeroplanes, therefore, we shall have to build tens of thousands for the Allies who will welcome this extremely valuable American contribution, not only for what it represents in actual engines, but because it will permit releasing thousands of mechanics from the motor factories to send to the front to make up additional areo squadrons.

In view of the great necessity of supplying France and England and our own aviators in France with high horse power motors, it is very unlikely that there will be more than a few available for the thousands of primary and advanced training machines to be used in the Army and Navy aviation schools. Half dozen motor manufacturers are ready to meet this need. Among the motors available are the Curtiss, the new and greatly improved Sturtevant, the Hall Scott, the Thomas, the Duesenberg, the Hispano Suiza, the Wisconsin, the New Union, the New Cleveland, the Aeromarine, the American Gnome, the Ashmusen and several others. Some of these motors ore better than others, but practically all have passed the experimental stage and are now ready for tuning up. So the Army and Navy will not lack motors of from 80 to 150 H.P. for their training machines.

The official report regarding the Liberty Motor follows:

Secretary Baker's Statement

The Secretary of War has made the following statement:

"The 'United States aviation engine' has passed its final tests. They were successful and gratifying. The new motor, designated by the Signal Service as the 'liberty motor,' is now the main reliance of the United States in the rapid production in large numbers of high-powered battle planes for service in the war. In power, speed, service ability, and minimum weight the new engine invites comparison with the best that the European war has produced.

One of the Big Accomplishments of U. S.

"I regard the invention and rapid development of this engine as one of the really big accomplishments of the United States since its entry in the war. The engine was brought about through the co-operation of more than a score of engineers, who pooled their skill and trade secrets in the war emergency, working with the encouragement of the aircraft production board, the War Department, and the Bureau of Standards.

"The story of the production of this engine is a remarkable one. Probably the war has produced no greater single achievement.

"One of the first problems which confronted the War Department and the aircraft production board after the declaration of hostilities was to produce quickly a dependable aviation motor. Two courses were open. One was to encourage manufacturers to develop their own types; the other to bring the best of all types together and develop them.

Standard Motor the Objective

"The necessity for speed and quantity of production resulted in a choice of the latter course, and a standard motor became our engineering objective.

"Two of the best engineers in the country, who had never before seen each other, were brought together at Washington and the problem of producing an all-American engine at the earliest possible moment was presented to them. Their first conference, on June 3, lasted from afternoon until 2.30 o'clock in the morning.

"These two engineers were figuratively locked in a room in a Washington hotel and charged with the development of an aeroplane motor for use by American aviators over the battle fields of Europe. For five days neither man left the suite of rooms engaged for them. Consulting engineers and draftsmen from various sections of the country were brought to Washington to assist them. The work in the drafting room proceeded continuously, day and night. Each of the two engineers in immediate charge of motor development alternately worked a 24-hour shift.

Trade Secrets Given Up

"An inspiring feature of this work was the aid rendered by consulting engineers and motor manufacturers, who gave up their trade secrets under the emergency of war needs. Realizing that the new design would be a Government design and no firm or individual would reap selfish benefit because of its making, the motor manufacturers, nevertheless, patriotically revealed their trade secrets and made available trade processes of great commercial value. These industries have also contributed the services of approximately 200 of their best draftsmen.

"The two engineers locked together in a hotel room in this city promised the Government if given an opportunity they would design a satisfactory engine before a working model could be brought from Europe.

"A remarkable American engine was actually produced three weeks before any model could have been brought from Europe. It was promised that this engine would be developed before the Fourth of July. Twenty-eight days after the drawings were started the new engine was set up. This was on July 3.

Sent Here in Special Car

"In order to have the engine in Washington and in actual running order at the Nation's capital on Independence Day

the perfected engine was sent from a western city in a special express car. The journey was made in 21 hours and four young men guarded the engine en route to Washington and personally attended to its transfer from one railroad to another.

"With the need for speed as an incentive tools for building the first engine were made even before the drawings were finished—on the assumption that they would be correct.

"Parts of the first engine were turned out at 12 different factories, located all the way from Connecticut to California. When the parts were assembled the adjustment was perfect and the performance of the engine was wonderfully gratifying. This in itself demonstrates the capabilities of American factories when put to the test and when thoroughly organized for emergency work of this sort.

No Time for Theorizing

"One of the chief rules outlined at the beginning of the designing work was that no engineer should be permitted to introduce construction which had not been tried out. There was no time for theorizing. The new engine is successful because it embodies the best thought of engineering experience to date. Not only did this country furnish ideas through celebrated consulting engineers, but the representatives in the United States of England, France, and Italy co-operated in the development of this motor.

"Thirty days after the assembling of the first engine preliminary tests justified the Government in formally accepting the engine as the best aircraft engine produced in any country. The final tests confirmed our faith in the new motor in every degree.

"Both the flying and altitude tests of the new motor have been gratifying. One test was conducted at Pike's Peak, where the United States aviation engine performed satisfactorily at this high altitude. One of the engines, in an aeroplane, broke the American altitude record in a recent flying test.

"While it is not deemed expedient to discuss in detail the performances and mechanics of the new motor, it may be said that standardization is a chief factor in the development of the Government's motor. Cylinders, pistons, and every other part of the motor have been standardized. They may be produced rapidly and economically by a great many factories operating under Government contracts. They may be as rapidly assembled, either by these plants or at a central assembly plant.

"The new engine amounts practically to an international model. It embodies the best there is in American engineering and the best features of European models so far as it has been possible to adapt the latter to American manufacturing methods.

Had Every Available U. S. Suggestion

"The two engineers most directly connected with the production of the United States aviation engine had before them not only the blue prints and models of the most successful engines the war has produced but also every available American suggestion. Men skilled in the invention of motors, both automobile and aeroplane, advised these engineers who were charged with the duty of providing rapidly and unerringly a motor which would embody every essential for wartime use. Nonessential complexities were consistently discarded by these engineers. The result was a composite design of maximum power, minimum weight, great speed capability, and adaptability to quick production.

"The standardization of parts materially simplifies the problem of repair and maintenance. Spare parts will be promptly available at all times. Even the cylinders are designed separately. It is possible to build the new engine in four models, ranging from 4 to 12 cylinders, and under the standardization plan now worked out an 8-cylinder or a 12-cylinder model can be made, using the same standard cylinders, pistons, valves, cam shafts, and so on.

Question of Repairs Simplified

"This will make the question of repairs back of the lines a comparatively simple matter. The parts of wrecked 8-cylinder or 12-cylinder engines will be interchangeable, and a new engine may be assembled from the parts of wrecked machines.

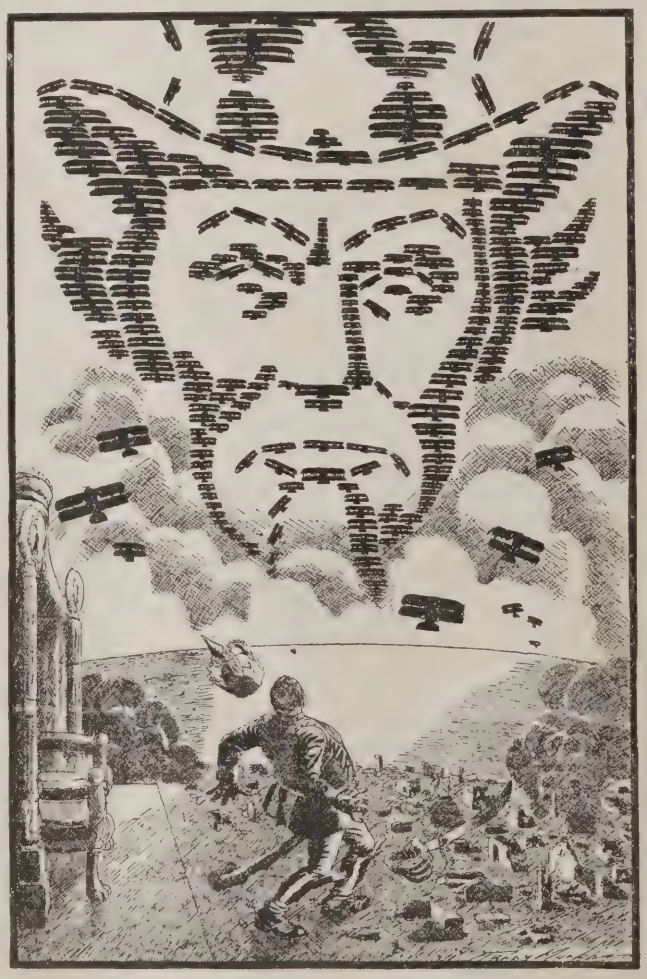
"The standardization of the new engine does not mean there will be no change in it during the war. There will be continuous experimentation as new types and improvements develop at the front and new ideas are born of the war emergency. If the engine can be improved, it will be improved; but as the motor stands today it is one of wonderful success and produced under dramatic circumstances.

"Construction of the new standard engine will not interfere with the continued manufacture of other serviceable models, either European or American, which existing plants are already turning out. The production of the United States motor will be carried on almost entirely in a new and expanding industrial field.

Deliveries to Begin Soon

"The Government is sometimes asked, 'Why does not the United States adopt one of the successful British or French high-powered machines and manufacture them?' British and French machines, as a rule, are not adapted to American manufacturing methods. They are highly specialized machines, requiring much handwork from mechanics who are in fact artisans. It would require a year or more to teach American manufacturers and their mechanics to turn out such high-specialized aeroplanes.

"With the completion of final tests of the motor—tests satisfied both expert engineers and Army officers—progress already has been made toward organizing industry for the manufacture of the new machines, and deliveries will begin within a comparatively short time."

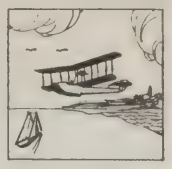


Uncle Sam's Fighting Face
Courtesy N. Y. American

It should be understood that the "new" motor is not strictly speaking an invention. No doubt it has what are in effect new values. But it is the result of a combination of the strong points of all the available contrivances of the kind. One of the most admirable facts recorded in Secretary Baker's report is the readiness of manufacturers to give the use of any patent that would help in the construction of the motor. This is patriotism. It is also good business judgment. The successful prosecution of this war is the first condition of all American business now.



THE NEWS OF THE WEEK



Aero Club Committee Visits Washington to Ask for Large Appropriations —Visits Langley Field.

The committee of the Aero Club of America, including Messrs. Alan R. Hawley, Congressman Murray Hulbert, of New York; Henry Woodhouse, William Dubelier and Sewell D. Andrews, director of the Aero Club of Minneapolis, who arrived in Washington on September 13, called on leading Congressmen to submit evidence that there are needed additional appropriations for aeronauts for the navy for the U-boat campaign.

They also conferred with aeronautical authorities of the Allies' commission regarding plans to solve the difficult problem of delivering aeroplanes to France by flying them across the Atlantic. They had conferences with French High Commissioner Tardieu, Captains S. Douril and De La Grange, of the French Air Service, and Captain Pomilio, of the Italian mission for aeronautics.

They also met General Cormack and Major Henney and Captain Hope, of the British Air Service, and were entertained at luncheon by officials. The commission left Washington for Langely Field, Virginia, on Friday to see the Italian war 'planes, which have been breaking records in the last few days. They have been invited to make flights by Major R. Perfetti, the head of the Italian misson for aeronautics. They arrived at the Langley field in rainy weather which lasted for three days and flooded the field so that no flights could be made, although the Italian warplanes were inspected. While waiting the committee held conferences with Government and military authorities on important subjects.

The authorities waiting at Old Point Comfort for the weather to clear on Saturday and Sunday included the following:

General Tozzi, head of the Italian mission in America; Captain Vannutelli, Italian navy, Italian Attaché in Washington; Dr. S. W. Stratton, director United States Bureau of Standards; Professor William F. Durant, chairman, National Advisory Committee on Aeronautics; General Guglielmotti, Italian Military Attaché in Washington; Alan R. Hawley, president Aero Club of America; Henry Woodhouse, member Board of Governors Aero Cub of America; Major Bion J. Arnold, E. O. R. C., U. S. A., member of the Naval Consulting Board; Major James Barnes, in charge of photographic section, Signal Office; Colonel E. A. Deeds, of the United States Aircraft Production Board; Major C. D. N. Campbell, British Royal Flying Corps; Major C. P. Bartholf, commanding officer Langley Field.

Also Captain George S. Wadsworth, S. O. R. C.; Edward J. Steichen, first lieutenant, S. O. R. C.; Lieutenant Michel, French Aviation Corps; Sergeant Haslatt, Royal Flying Corps; Captain A. Pomilio, Italian Flying Corps; Lieutenant G. Abetti, Royal Italian Flying Corps; William Dubilier, American radio expert; Lieutenant Silvio Resnati, Royal Italian Flying Corps; Richard Crane, secretary to Secretary of State Lansing; Edward Corcoran, secretary to Bernard Baruch; Lieutenant G. Brambilo, Royal Italian Flying Corps; Lieutenant Emanuel Lemaitre, French Flying Corps; Martin Vogel, Assistant Secretary of the Treasury; Lieutenant de Sangro, Italian army; Colonel Alberto Tozzi, Italian Flying Corps; Captain S. Vezzani, of the Italian aeronautic mission, and Lieutenant Amedeo Pomilio, Italian Flying Corps.

Just as we are going to press plans have been virtually perfected for the flights which members of the Italian aviation mission will make from Newport News, Va., to Washington and New York in demonstration of the aeroplanes brought to this country.

The flights will start from Langley Field, near Newport News. It is planned to fly with four of the Italian machines this week to Washington and return to Langley Field, while next week the same four machines are to fly to New York.

The aeroplanes will represent four different types, the Caproni, the Sia, or Fiat, the Pomilio, and the Macchi. The pilots will be Lieutenants Resnati, Baldioli, Ballerini, and Adamoli. The Caproni is 450 horse power, like the other three planes a biplane, and is equipped with three engines. The plan is for it to make the flight to Washington with ten passengers. The other machines will carry one pasesnger each, except the Macchi, which will carry only the pilot. The Caproni is a bombarding plane, and the Macchi a fighting machine; the other machines are used in reconnoissance work.

There are several Italian fighting aircraft at Langley Field. One is a huge Caproni triplane waiting for the hangar to be completed before it is assembled. This machine will carry three tons, accommodating easily twenty-five passengers. It has 700 horse-power, and travels ninety miles an hour, this type being used chiefly for bombardment.

Side-by-Side Tractor Tested

The new side-by-side primary training tractor, constructed by the Ordnance Engineering Company, has satisfactorily completed a series of trial flights at the company's flying field on Long Island. Flights have been made on the average of two a day for the last three weeks, and every flight, including the first, was made with a full load, and fuel sufficient for three hours. Upon each occasion it rose quickly and steadily, and trimmed easily in the air. The control surfaces are generous and the machine immediately responds to the slightest movement of the control. Landings are made with great ease and without the slightest jar. Dual stick control is installed.

On Saturday, September 15, E. C. Bass, one of the officials of the company, made a flight for three-quarters of an hour at an altitude of 3,600 feet. A gusty wind was blowing all afternoon, but it had little effect on the balance of the machine. The machine is piloted by Bert Acosta, Chief Civilian Instructor at one of the Signal Corps Aviation Stations. Walter H. Phipps, who designed the machine, and Geo. F. McLaughlin, of Aerial Age Weekly, made flights with Acosta. So little effort was required for the pilot to handle the machine that he continued to make a succession of short flights until prevented by darkness. The machine is equipped with a 100 H.P. Duesenberg motor, and the landing chassis provided with Ackerman wheels.

Mr. Curtiss Again Honored

A letter has just been received from the Aero Club of France stating that as a mark of appreciation for his efforts in the interests of aviation, Glenn H. Curtiss has been elected a Life Member of the Aero Club of France.

Col. Roosevelt in Air Flight

To Colonel Roosevelt fell the honor of participating in the first public flight of an aeroplane equipped with a Liberty motor. The Colonel accompanied H. W. Blakeley, an army instructor, in a remarkable test spin over Hempstead, Garden City and adjoining towns in Nassau County, L. I.

Colonel Roosevelt was truly "delighted" with his experience, particularly the fact that the craft was driven by the new motor of American invention. During the forty-five minutes in which the craft was in the air the powerful engine demonstrated amply why the Army Signal Corps has adopted it as its standard.

Colonel Roosevelt donned a regulation helmet and gloves and climbed into a seat behind Mr. Blakeley.

The aeroplane was a new L. W. F. biplane. After rising to 2,000 feet at what was said to be a phenomenal climbing angle, the biplane again went ahead for a short time, then climbed to 5,000 feet.

Blakeley and his passenger circled over Hempstead and Garden City at bewildering speed. There were a dozen other planes up at the time, but the Liberty Motor gave the big L. W. F. such velocity as it whizzed by them that they seemed to be at a standstill.

At Garden City, the guests, many of whom had heard of the contemplated flight, streamed out on the lawns and peered up at the machine. Several French, British and American aviation officers were watching.

"The aeroplane has shown a wonderful development," Colonel Roosevelt said. "Simply wonderful. It forecasts a greater development in commerce, as well as in war."

Vogel Flies in War-Plane

Fortress Monroe, Va.—Martin Vogel, Assistant Treasurer of the United States in New York City, made an ascent from Langley Field Sept. 11 in a seven passenger Italian Caproni war aeroplane piloted by Lieut. Resnati of the Royal Italian Flying Corps. This was the first flight of an Italian war plane in this country.

Mrs. Vogel, Miss Reiss and Miss Gleason, members of Mr. Vogel's party; Bion Arnold of the Naval Advisory Board and Capt. Wadsworth, U. S. A., and Captain Carlo Tappi of the Italian Flying Corps also were passengers.



Col. E. A. Deeds



Major J. G. Vincent



Col. Sidney D. Waldron

Three of the four principal engineers who developed the Liberty Aviation Motor. We regret that Major E. L. Hall's, the other engineer, dislike for photography prevents our presenting his picture also.



Three views of the army reconnaissance Pomilio biplane, equipped with a 200 H.P. Fiat engine. The machine has a span of 38′, length 30′ 1⅝″, height 10′ 2″. The weight empty is 2093 lbs.

Devotes "Perfect" Brain to Flying

Boston.—Thomas James Abernethy of West Pembroke, Me., whom the late Prof. Muensterberg found to be mentally perfect, is one of 999 New England candidates selected for instruction as aviators. He heads the list—but it is arranged alphabetically.

The man with the 100 per cent. brain selected by the professor will now learn the best methods of fighting in the air against the country which sent Prof. Muensterberg to Harvard. Abernethy had planned to enter business with his father at West Pembroke. After the test, Abernethy said:

"Prof. Muensterberg told me several times that I had a good mind, but that I was lazy and should do better in my classes. He said I couldn't earn my salt as a salesman, but recommended my entering the canning business."

The tests were made on 340 men who attended the professor's classes in psychology.

Thomas-Morse Orders Pasco Wheels

The National Wire Wheel Works, of Geneva, N. Y., announce that they have just closed a contract with the Thomas-Morse Aircraft Corporation, of Ithaca, for a large order of "Pasco" aeroplane wire wheels which they will use on the small scout machines they are now making for the Government.

The Late E. B. Cresswell

As the result of injuries sustained by falling in an aeroplane piloted by Louis Bodor, Egbert B. Cresswell died at Davenport, Iowa, on September 9. He had been general manager of the Davenport Aviation School, and at the time of the accident was having a pleasure trip.

It will be remembered that Cresswell was formerly sales manager of the Thomas Aeroplane Co., at Ithaca. He was held in esteem by all who knew him, and his death removes from aeronautics one of the most promising business executives. Much sympathy is expressed for his widow.

Believes U. S. May Win War in Air

Paris.—Leon Bailby, writing in *L'Intransigeant* on America's participation in the war, says:

"When Americans first suggested finishing the war by aviation charges, attacking Berlin through the air, many of us doubted the practicability of the plan. We knew what determination and resources our new allies had and that they would do everything in the shortest time possible to build formidable aerial squadrons, but we also realized the difficulties in the way.

"From month to month the aeroplane has become a more perfect fighting machine. Woe to the belligerent hat lags behind in perfect-quickest to change hands. Time therefore is ing its planes, for mastery of the air is the necessary before Americans can make a sufficient number of machines of our models and can train enough pilots, but with these reservations we expect a great deal of American aviation and of our own.

"On the Aisne, in Flanders, and at Verdun airmen have attacked infantry. The Italians have used them in many instances, especially in the pursuit of the enemy, where they took the place of cavalry. Veritable squadrons of forty airplanes each, big Caproni machines, attacked the retreating Austrian columns. One entire Austrian unit was annihilated by these frightful charges and the entire rear was disorganized. The Italian aviation cavalry has brilliantly demonstrated its usefulness in modern battles, and America will heed the lesson—France likewise."

Manufacturers' Representative

At a recent meeting of the American and Foreign Sales Corp., the following officers were elected: John L. Newbold, president, (president Merchants Transfer & Storage Co.); Ross P. Andrews, vice-president, (President R. P. Andrews Paper Co.); E. E. Thompson, secretary and treasurer, (head of firm of Crane, Parris & Co.); Louis C. Witkowski, sales manager. The purpose of the corporation is to render an efficient service to both the selected large manufacturers who want personal representation before the Government and to the various branches of the U. S. Government. The corporation has been particularly fortunate in securing the services of Mr. Witkowski, who has represented one of the largest manufacturing concerns of the United States for more than 20 years.

U. S. Aviator Whom French Honor Here

An American aviator with the French army, who has brought down six German aeroplanes, arrived in America recently on a Spanish liner, He is Capt. Alfred Gay of San Francisco.

In one of his air encounters Gay brought down single handed a German machine of the Gotha type, carrying four men and three machine guns.

Captain Gay has the French Legion of Honor medal and also the French War Cross. He will visit his mother and sister in San Francisco and expects later to be assigned to instructing American aviators. His retirement from active service in France is due to a bullet wound he received in an air engagement.

Aircraft Board Legalized by Act of the Senate

Washington.—The Senate has passed the Sheppard bill legalizing the Aircraft Board, a long step in developing the big aviation programme of the United States. Senator Sheppard of Texas, author of the bill, made this statement after its passage:

"The bill gives the present Aircraft Committee of the Council of National Defense a legal status and puts it under the joint control of the War and Navy Departments. All production contracts are subject to the control and approval of the Secretaries of War and Navy.

The board is authorized to supervise and direct, under the requirements prescribed by the War and Navy Departments, the purchase, production and manufacture of airship equipment and machinery, including purchase, lease or construction of plants.

"The board will co-operate effectively with our allies in developing an aviation war programme on a gigantic scale."

It provides that the personnel of the board shall consist of the chief signal officer of the army, the chief constructor of the navy and not more than seven other members, to be appointed by the President with consent of the Senate.

It is understood that Howard E. Coffin, chairman of the present Aircraft Production Board, will be the chairman of the new legalized body.

Planes Crash in Air

San Diego, Cal.—Edward M. Walsh, Jr., of Oakland, and Theodore B. Lyman, of St. Helena, Cal., privates in the United States Signal Corps, were killed September 13.

While flying at the North Island aviation school the aeroplanes piloted by the two men crashed together 400 feet above the earth. Both machines burst into flames and fell.

Swett Represents Cradock & Co.

Samuel Swett, manufacturers' agent and importer, has secured the American representation of the well-known English wire rope manufacturers, George Cradock & Co., Ltd.

George Cradock & Co., Ltd., have had over sixty years' experience in the manufacture of steel wire ropes and are able to claim and do claim, by additional experience (dating from the very earliest advent of flying, both in England and on the Continent), special expert knowledge in connection with, and the manufacture of the type of strands, cables and tension wires best suited to the aircraft industry —there are none better manufactured. They are still executing considerable contracts for these special strands and cables for the British and Allied European Governments, and owing to the high standard of their product are enjoying an ever increasing demand.

Lippincott Enters Aeronautic Field

We announce with pleasure the entrance of the old established house of A. H. & F. H. Lippincott, of Philadelphia, into the aeronautical field as manufacturers of accessories and fittings; specializing on nickel steel bolts, castellated nuts and turnbuckles. Almost their entire production pertains to aircraft.

Established fifty years ago and with a reputation for fine mechanical work the entrance of this well-known house in the aeronautic industry is a real gain. Mr. F. H. Lippincott is well known as a prominent inventor and their entire organization is a trained corps of skilled mechanics under the leadership of competent engineering talent. Their factory superintendent, Mr. W. H. Sheahan, is a director of the Aero Club of Pennsylvania, and has been actively engaged in aeronautic work for the past eight years.

Fall Kills Meeker Training at Front

Paris.—Corporal William Henry Meeker, of New York, an aviator attached to the Lafayette Escadrille, was killed at Pau on September 14 in an aeroplane accident due to his motor stalling. Meeker, who formerly was editor of the *Harvard Crimson*, arrived at Bordeaux from New York on May 31 and immediately entered the air service.

Lincoln Motor Co. Acquires Land

Detroit.—The Lincoln Motor Co., organized recently by W. C. Leland and Henry M. Leland, has acquired 30 acres of land and will and new buildings as additional units to the present plant. The company anticipates that a production schedule will start by October 1. The Packard Motor Co. and the Lincoln Motor Co. are making complete aeroplane engines for the government.

Aeroplane Workers Exempted

Washington.—Owing to the unusual demand for aeronautic workers by the government, an executive order has been issued waiving civil service rules as regards this class of experts.

Cornell to Concentrate on Aero Service

Ithaca, N. Y.—President Schurman has announced that Cornell University will this year devote the new drill hall exclusively to the United States School of Military Aeronautics.

The Washington authorities now desire to send four cadets a week to the United States School of Military Aeronautics. This will make an attendance of 360, and in view of the fact that the school has been constantly enlarged since its foundation, President Schurman thinks that still further enlargement may be necessary.

List of Americans Flying For France

The New York *World's* Paris correspondent has procured the full officnal list of members of the Lafayette Escadrille. Their names, decorations and former service follow:

Lieut. William Thaw, Pittsburgh, Legion of Honor and Cross of War with three palms, joined March, 1916, former member of the Foreign Legion.

Lieut. Raoul Lufbery, Wallingford, Connecticut, Legion of Honor, Military Medal, Cross of War with three palms and English Military Medal, joined April, 1916, formerly aviation mechanic.

Adjutant Didier Masson, New York, Military Medal and Cross of War, joined April, 1916, formerly with French Reserve.

Adjutant C. Choteau Johnson, St. Louis, Mo., Cross of War with palm, joined May, 1916, formerly in ambulance service.

Adjutant Willis Haviland, Minneapolis, Minn., Cross of War with palm, joined October, 1916, formerly in ambulance service.

Sergt. Dudley Hill, Peekskill, N. Y., joined May, 1916, formerly with French Medical Corps.

Sergt. Robert Soubiron, New York, joined October, 1916, formerly with the Foreign Legion.

Sergt. Edwin C. Parsons, Springfield, Mass., joined December, 1916, from the ambulance service.

Sergt. Stephen Bigelow, Boston, joined February, 1917, entered Escadrille from college.

Sergt. Walter Lovell, Concord, Mass., Cross of War with palm, joined March, 1917, formerly served with ambulance.

Sergt. Kenneth Marr, San Francisco, joined March, 1917, formerly with ambulance.

Sergt. William Dugan, Rochester, N. Y., Cross of War and Foreign Legion decorations, joined March, 1917, formerly with Foreign Legion; now in America on leave.

Sergt. Ray Bridgman, Lake Forest, Ill., joined April, 1917, entered squadron from college.

Sergt. Henry S. Jones, Herford, Pa., joined April, 1917, formerly in ambulance service.

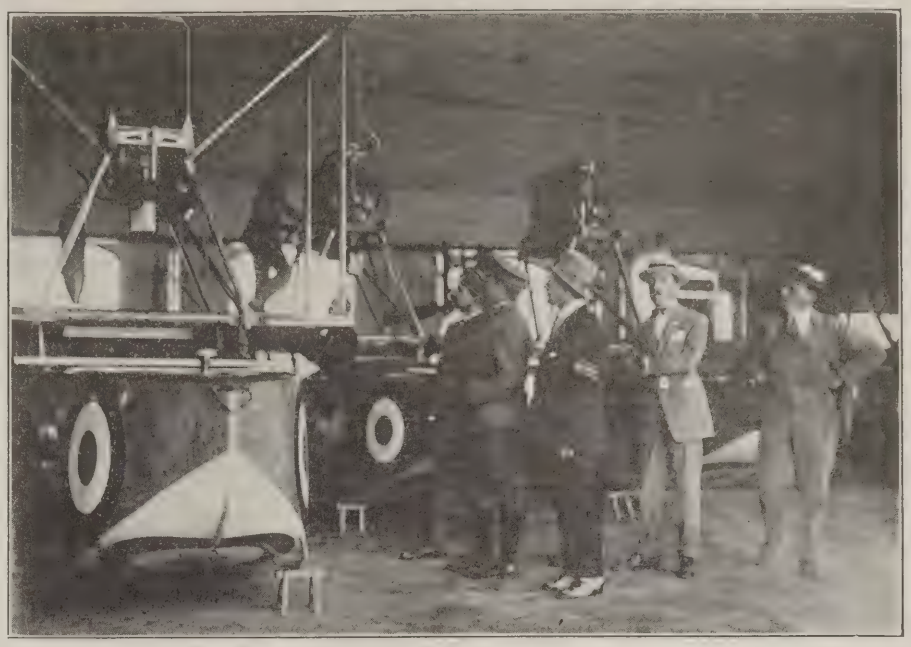
Sergt. David Petersen, Honesdale, Pa., joined May, 1917, entered service from college.

Sergt. Andrew C. Campbell, Chicago, Cross of War with star, joined April, 1917, formerly professional dancer.

Sergt. Douglass MacMonagle, San Francisco, Cross of War, joined June, 1917, from ambulance service.

Corp. Charles Dolan, Boston, joined May, 1917, formerly with Sperry Stabilizer Company.

Corp. Ralph Doolittle, Chicago, Cross of War, with palm and English military medal, joined July, 1917, formerly in ambulance service.



The American aeronautic commission visiting an Italian aeroplane factory and inspecting one of the Macchi flying boats

Corp. James N. Hall, Colfax, Iowa, now in hospital with wounds, French military medal and Cross of War, joined July, 1917, formerly with the English Army.

Lieut. Bert Hall, Galveston, Texas, French Military Medal and Cross of War with two palms, joined in 1915; now in America on leave.

Eliot Cowdin, Military Medal and Cross of War with two palms, resigned.

Two Are Prisoners

Twe members of the squadron, James Bach and Harold Willis, are prisoners of Germany. Willis had previously won the Cross of War with one palm.

Members who have been killed in action:

Sergt. Robert Rockwell, Cincinnati, O., joined October, 1914, formerly with the French Medical Corps.

Victor Chapman, Cross of War with two palms.

Norman Prince, Legion of Honor, French Military Medal and Cross of War with two palms and one star.

James McConnell, Cross of War with one palm.

Ronald Hoskier, Cross of War with one palm.

Edmond Genet, Cross of War with one palm.

Safeguards for the Beginning in Flying

In an interesting item in *The Curtiss Flyleaf* Capt. A. W. Briggs has this to say about safeguards for the beginner in flying:

"Carefully look the machine over, paying especial attention to controls, oil, gas and water. Set the insruments and know that everything is right before getting into the machine. Run up the engine and insist on its doing ts normal revolutions on the ground. Taxi to the extreme end of your field and always, when possible, take off into the wind. Keep the machine straight, wings level, and get the tail up before leaving the ground.

"A good take-off is always accomplished by getting the machine into a flying position and letting her take herself off. Once off, level out for an instant, permitting the machine to gain its flying speed. Then gradually begin the climb so that when about 100 feet off, the best angle is obtained. Keep a straight course until about 200 feet up, then, when necessary, make a slow turn, making the rudder and bank fit at something under 45 degrees, keeping the machine level.

"Learn the rules of the air. Never neglect them. Pay at least as much attention to what is going on around and below you as to the machine. Keep good fields beneath you and never fly over obstacles of any kind while at a low altiude.

"In descending to a landing, shut off the motor over the field. Spiral or letter "S" down to about 700 feet, then go straight into the landing.

"Practice slow landings, and always try to get the tail and wheels down togeher. On the ground again, learn to keep the machine straight until it stops. Do stunts if you must, but go to 7,000 feet to do it, and remember—when in trouble the best remedy *always* is—stick her nose down."



William A. Morgan, manager of the Curtiss Aeroplane and Motor Corporation, addressing employees of the Curtiss Company

NAVAL and MILITARY AERONAUTICS

Reorganization of Signal Corps

Brig. Gen. George O. Squier, C.S.O., and his assistants have about completed plans for the reorganization of both branches of the Signal Corps made necessary by the Act of July 24, 1917. When completely reorganized the corps will include 10,000 officers and 20,000 men. Under the above legislation, which appropriated $640,000,000, the President was authorized to provide the necessary additional commissioned personnel by promoting, appointing, detailing or attaching as temporary officers of the corps, officers of the Regular Army, National Guard or National Armies, the Reserve Corps, or from enlisted men and civilians. Officers not above the rank of colonel could be appointed without the consent of the Senate and irrespective of rank or grade held on date of the passage of the act.

The following recommendations have been made for appointment to the position in the "new" corps, Aviation Section, some of the officers having already been appointed.

To be brigadier generals: Col. Charles McK. Saltzmann, S.C., for duty in charge of land operations; Major Benjamin D. Foulois, Aviation Section, S.C., in charge of air operations.

To be colonels: Liept. Col. Charles DeF. Chandler, S.C., balloon operations; Major George F. Mitchell, S.C., in charge of instruction; Major Stanley D. Embick, C.A.C., Gen. Staff, aircraft production board; Major Henry H. Arnold, aviation section, air organization; Major John J. Carty, S.O.R.C., consulting engineer; Edward A. Deeds, aircraft production board, equipment division; Robert L. Montgomery, aircraft production board, finance and supply division, and Capt. Sidney A. Waldon, S.O.R.C., equipment division.

To be lieutenant colonels: Major Townsend F. Dodd, Aviation Section, S.C., department of material; Major Virginius E. Clark, Aviation Section, S.C., aeroplane engineering division; Major Robert H. Wllis, jr., Aviation Section, S.C., ordnance armament; Major Thomas de W. Milling, Aviation Section, S.C., in charge of training; Major Joseph C. Morrow, jr., Aviation Section, S.C., inspection duty; Major Carleton G. Chapman, Aviation Section, S.C., aviation representative abroad; Major Joseph C. Carberry, Aviation Section, S.C., instruction duty; Major William H. H. Hutton, jr., Q.M.O.R.C., production expert; and Melville W. Thompson, finance and supply division.

To be majors: Charles R. Sligh, and Jesse G. Vincent, equipment division, and First Lieut. Birdseye B. Lewis, Reserve Corps, division of finance.

To be captains: First Lieut. Albert B. Lambert, S.O.R.C., balloon division; and Arthur G. Cahle, aircraft production board.

Assignments

First Lieutenant John B. Stetson, Jr., aviation section, Signal Officers' Reserve Corps, to active duty at Mineola, L. I., N. Y.

Lieutenant Colonel George H. Crabtree, United States Army, retired, to New York, N. Y., and Boston, Mass., on official business in connection with the inspection of the physical examining units, Aviation Section, Signal Officers' Reserve Corps.

First Lieutenant Robert R. McMath, Aviation Section, Signal Officers' Reserve Corps, to active duty at Signal Corps Aviation School, Mineola, Long Island, N. Y.

S. O. R. C.

Capt. J. F. Dillon, S.R.C., to New York, N. Y., for temporary duty in connection with the transportation of civilian field clerks assigned to duty abroad. (Aug. 28, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Capt. H. C. Candee to Washington; Capt. H. B. Williams to Princeton, N. J.; 1st Lieut. G. H. Hughes to Aviation School, Rantoul, Ill.; 1st Lieut. J. E. Barbey to Washington; 1st Lieut. H. G. Canda to Fort Sam Houston, Texas; 1st Lieut. Philip M. Prescott, Jr., to Fort Sam Houston, Texas; 1st Lieut. Alfred J. Ralph to School for Aerial Observers, Fort Sill, Okla.; 1st Lieut. J. F. Carr to School for Aerial Observers, Fort Sill, Okla. (Aug. 29, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Major H. E. Shreeve to Governors Island, N. Y.; Capt. H. P. Van Keuren to Langley Field, Hampton, Va.; Capt. G. R. Wadsworth to Langley Field, Hampton, Va.; 1st Lieut. L. G. True to Aviation School, Mineola, N. Y., as adjutant of supply depot. (Aug. 29, War D.)

Capt. R. B. Clayton, Av. Sec., S.O.R.C., to duty Governors Island, N. Y. (Aug. 30, War D.)

First lieutenants of Av Sec., S.O.R.C., to duty Camp Kelly, San Antonio: E. Kenway, M. V. Bishop, H. W. White, jr., G. V. Smith, G. E. Musselman, L. D. Mahan, L. S. Baird, C. W. Haner, J. Frost, W. L. Foulke, F. Stratton. (Aug. 31, War D.)

Signal Corps

First Lieut. W. A. Robertson, Cav., Av. Sec., S. C., rated as a junior military aviator, to date from Oct. 13, 1916. (Aug. 29, War D.)

Sergts. 1st Class W. R. Morrison and H. A. Moore, Sergts. G. Smith and J. Schlarb, Av. Sec., S.C., from C.Z. to the 20th Aero Squadron, Fairfield, Ohio, for duty. (Aug. 27, War D.)

Following first liutenants in Av. Sec., S.C., rated as junior military aviators from the dates set, all in 1916: C. W. Russell, Inf., Oct. 14; M. F. Harmon, jr., Inf., Oct. 15; M. Kirby, Cav., Oct. 15; H. D. Davidson, Inf., Oct. 16; D. Johnson, Inf., Oct. 16. (Aug. 29, War D.)

First Lieut. W. P. Smith, Av. Sec., S.C., to duty to Fort Sam Houston, Texas. (Aug. 30, War D.)

Officers of Av. Sec., S.C., to duty as follows: Major S. W. Fitzgerald to Mount Clemens, Mich., Signal Corps Aviation School; Major C. P. Bartholf to Washington, D.C., and report to C.S.O.; Capt. R. S. Brown to Langley Field, Hampton, Va.; Sergt. 1st Class C. W. Winters, 1st Co., 2d Aero Sqdn., S.C., to Fort Sam Houston, Texas, duty with an aeronautical organization in S.D. (Aug. 31, War D.)

Capt. T. S. Baldwin, Av. Sec., S.C., to Washington for duty. (Aug. 31, War D.)

First lieutenants of Av. Sec., S.C., to duty as follows: M. E. Knight to Mineola, L.I., N. Y., S.C. Av. School; W. C. Douglas to Mineola, L.I., N.Y., S.C. Av. School; H. S. Bagley to Fort Sill, Okla., School for Aerial Observers. (Aug. 31, War D.) * * *

Capt. Walter S. Cornell, Medical Reserve Corps, is relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Ind., and will proceed to Belleville, Ill., and report in person to the commanding officer, that place, for duty as medical member of the examining board, Signal Corps Aviation School, and by letter to the commanding general, Central Department.

* * *

First Lieut. Edward R. Kenneson, Aviation Section, Signal Officers' Reserve Corps, is announced as on duty that requires him to participate regularly and frequently in aerial flights from May 9, 1917.

* * *

Maj. Virginius E. Clark, junior military aviator, Signal Corps, will proceed at once to Washington, D. C., and upon arrival report to the Chief Signal Officer of the Army for assignment to duty.

* * *

First Lieut. R. W. Jannus, Aviation Section O.R.C., to Mount Clemens, Mich.; First Lieut. H. J. France, Aviation Section O.R.C., to Panama.

* * *

Placed on active list: First Lieut. John McRae, Aviation Section O.R.C., to Mount Clemens, Mich.; First Lieut. L. O. McQuitty, Aviation Section O.R.C., to Belleville, Ill.; First Lieut. C. A. Campbell, Aviation Section O.R.C., to Ohio State University, Columbus; First Lieut. H. M. Sadler, Aviation Section O.R.C., to Chief Signal Officer of the Army, Washington, D. C.; First Lieut. F. P. McCreery, Aviation Section O.R.C., to Fairfield, Ohio.



Student airmen getting their setting up exercises in the early hours of the morning

Canadian Camp Fort at Fort Worth

According to the Fort Worth (Texas) *Record* the contract for the construction of the aviation camp to be placed there by the government for the use of the Canadian government in training aviators, has been awarded to John W. Thompson, general railway contractor, St. Louis, Mo. The work on the camp will begin immediately and will be rushed to completion.

The Aviation School at North Island

Tentative plans for the construction of new buildings for the signal corps aviation school at Rockwell field, North Island, have been made public by the San Diego *Union*.

Quarters for the commander of the aviation school and the subordinate officers will be erected on a bluff at the southeastern corner of the island. The commandant's house and that of the adjutant, or second in command will face northward. The other officers' quarters will be placed in a semi-circle or arc, all being grouped so as not to cover too great an area.

Extending along the shores of Spanish bight from the officers' quarters will be the large number of other structures to be used for various purposes. First will be the well-equipped hospital and then in sequence the non-commissioned officers' quarters, cadet barracks, post exchange, amusement building or theatre, enlisted men's barracks, storehouses and industrial plants, the latter including machine shops, woodworking establishments and motor testing blocks.

Facing the aviation field and extending along a considerable distance of the southeastern shore line will be brick hangars capable of housing a large number of aeroplanes.

Chanute Field Completed

The Bloomington (Illinois) *Pantagraph* states that Chanute field, the U. S. aviation camp at Rantoul, is completed at a cost of more than a million dollars. All records were broken in the construction of Chanute. Work first started on Chanute field on May 28, and was rushed from beginning to end. The field was really completed a week ago when a party of government officials including Capt. C. G. Edgar, Maj. Arnold, and Col. Crabtree visited Chanute field, inspected it, and accepted it with the provision that a few minor changes be made. This work was all completed on Saturday and the field was turned over to the government. During the progress of the work the weather man was working against the contractors, for Cass Clifford, who had charge of the office force, has figured where there were eighteen days of rain during the period of construction. Despite this a record was established which will probably stand for a long time.

Chanute field is getting more like a little city every day and the municipal improvements will continue, the newest additions being a garbage disposal plant, and a fire department.

The army Young Men's Christian Association building continues to be one of the centers of activity.

LIST OF MEN GRADUATED FROM ARMY AVIATION "GROUND SCHOOLS" AT VARIOUS UNIVERSITIES

The following is a list of the September 8 graduates of the Army aviation ground schools:

Princeton University

William K. Andrews, Jr., Arthur M. Billard, Walter M. Boadway, Matthew L. Cahill, Eno Campbell, Holbrook B. Cushman, Francis B. Foster, Arthur Halsted, Godfred L. Jacobi, Emmet M. Kayler, Walworth P. Pattison, Charles G. Slauson, Henry J. Spalding, and Herbert Spencer.

University of Ohio

Clarence V. Ashbaugh, Oliver Thomas Beauchamp, Henry V. Bell, Clarence M. Bellows, Simon H. Dicran, Frank W. Fisher, Kenneth E. Griffith, John K. Grisard, Frank E. Harding, Earl M. Harvey, Harry J. Kirches, Edward J. Larkin, Hugh Lowery, James H. S. Olds, Paul T. O'Neill, Joseph B. Roberts, jr., Harmon C. Rorison, Stephen A. Ross, Fred L. Smith, Herman D. Southwick, Graham Spencer, Merrill A. Squier, Milan H. Stocking, Clinton I. Sutton, Townsend John Taylor, Lewis Rodda Trezona, John E. Upston, Claude Edward Vollmayer, Carrol F. Watson, and Donald B. Warzburg.

University of California

Robert M. Anderson, Marshall S. Boggs, Merle L. Briggs, W. R. Bruce, Ernest R. Burnight, John F. Burton, James H. Clark, Harold H. Edgar, John J. Elliott, George W. Fish, Walter R. Flachsenhar, W. E. Grimmer, Thayer D. Hall, Roger W. Hitchcock, Edward P. Howard, Leland D. Hurd, C. A. Kinney, C. Kenneth Leggett, David A. Loomis, Harold A. Lorenz, Harry A. Lynch, J. S. Marriott, George D. Ream, Wayne B. Stephenson, Martin L. Ward, jr., Floyd C. Watkins, Harold M. Weeks, D. W. Willard and Kenelm Winslow, jr.

Cornell University

Malcolm G. Allison, Sidney W. Beauclerk, jr., John M. Bowman, Charles S. B. Cline, Byron G. Cook, Raymond F. Fox, Eugene W. Gilmore, Schuyler L. Hoff, Lester S. Lamb, Arthur L. Lewis, Lawrence C. Lovell, Wm. V. Lovell, Harold E. Mensch, Joseph M. Murphy, Charles A. Schilling, Wm. C. Thomas, Gerritt V. Weston, Archie S. Woods, and Howard S. Wright.

University of Illinois

Rodney M. Armstrong, Herbert P. Bartholf, George N. Belser, Franklin O. Carroll, Leslie G. Chandler, George S. Clark, D. H. Crimmins, Raymond E. Davis, George W. Furlow, J. Cecil Leonard, Tom K. Monahan, Edward Orr, Chas. H. Piebes, Abner W. Shields, John M. Simpson, Ralph E. Spake, John M. Stanley, Wade Stevens, and Arthur M. Weirick.

University of Georgia

R. D. Bedinger, J. W. Burton, W. D. Coney, L. E. Ellis, Chas. E. Ensing, S. P. Gaillard, jr., P. H. Mell, W. B. McCoy, S. P. McGrew, Lawrence N. Polk, L. W. Powell, M. A. Quina, and C. G. Stephens.

University of Texas

Henry C. Allein, James B. Biggs, C. Gerald Bishop, Scott Howe Bowen, John P. Brooks, Marshall C. Callender, William F. Centner, C. E. Clarkson, D. D. Corning, Robert N. Cowham, Joseph M. Dawson, Lloyd M. Deshong, Charles G. Duddleston, Leslie A. Fernandez, Bort. F. Goodyear, Josiah F. Haskings, C. E. Hyde, David K. Jackson, Wm. P. Jennings, J. Thad Johnson, Edward M. Johnston, H. Klyver Russel, Burton F. Lewis, F. J. Lynch, Ralph P. McLaughlin, Horace W. Mitchell, James G. Ray, Thomas P. Sandefur, T. A. Scott, J. W. Simpson, Paul F. Slocum, Vernon B. Trevellyan, Harry Weddington, Hugh F. Willis, Jas. R. Worthington, Walter W. Wotinka, and William Zehner.

Massachusetts Institute of Technology.

Robert L. Cleveland, George W. Forrester, and Harry W. Wilmer.



Bennett Moulter, sole American representative in Escadrille 102 of the French Aviation Corps, and the Spad machine which he has been piloting over the German lines on the Belgian front

ARMY AERONAUTICS

Personnel of Army Aviation School at Cambridge, Mass.

Capt. Fred Seydel, commandant.

C. H. Peabody, president of academic board.

Charles J. Emerson, assistant to president of academic board.

Capt. Andrew W. Sellards, medical officer.

First Lieut. Ernest J. Wessen, S. O. R. C., supply officer.

First Lieut. Charles G. Miller, S. O. R. C., chief infantry instructor.

Sergt. Anthony J. Flynn, retired, Signal Corps, assistant to supply officer.

Pvt. Oliver J. Gagne, Signal Corps, instructor in rigging and land, gear and tools.

Dr. Butler, post surgeon.

William Goss Brown, Herbert Smith, Frank M. Kanaly, R. C. Ward, and B. A. Fales, instructors.

Assigned to Duty in Canada

Capt. John A. King, Quartermaster Officers' Reserve Corps, is assigned to active duty and will proceed at once to Toronto, Canada, and report in person to the commanding officer, Signal Corps, Aviation School, for assignment to duty as a supply and disbursing officer.

Signal Corps

Col. Charles McK. Saltzman, Signal Corps, to be brigadier general from July 24, 1917.

Maj. Benjamin D. Foulois, Signal Corps, to be brigadier general from July 24, 1917.

Graduates of the Aviation "Ground Schools" Sept. 1

The following is a list of September 1 graduates of the aviation ground schools:

University of California

Clifford S. Andrews, Louis C. Brichta, Harold R. Crowell, Frank B. Dudley, Herbert O. Russell, Valentine S Miner, Livingston L. Baker, Addison Brown, Lester B. Cowgill, Henry R. Eckert, Harold H. Edgar, T. R. Evans, William O. Frost, George V. Grey, Grover Herring, Jerry T. Illich, Harold M. McKnight, Philip P. Martin, Joseph R. Pearson, Jr., Harvey W. Proser, George D. Ream, Wellington Rupp, La Clair D. Schulze, Hurford S. Sharon, Herbert J. Simon, Cony U. Woodman.

Cornell University

Thomas Byrne, Kenneth M. Cunningham, Leonard J. Desson, Linn H. Forster, John W. Fulford, Weston W. Goodnow, Charles L. Heater, John F. Merrill, Robert N. Dippy, Austin F. Morrison, Clark B. Nichols, Parvin E. Paules, John J. Quinn, Richard B. Reed, Hilary B. Rex, Wilbur C. Suiter, Gilbert A. Woods, Harold F. Alexander.

THE GERMAN GUN-TUNNEL GOTHA

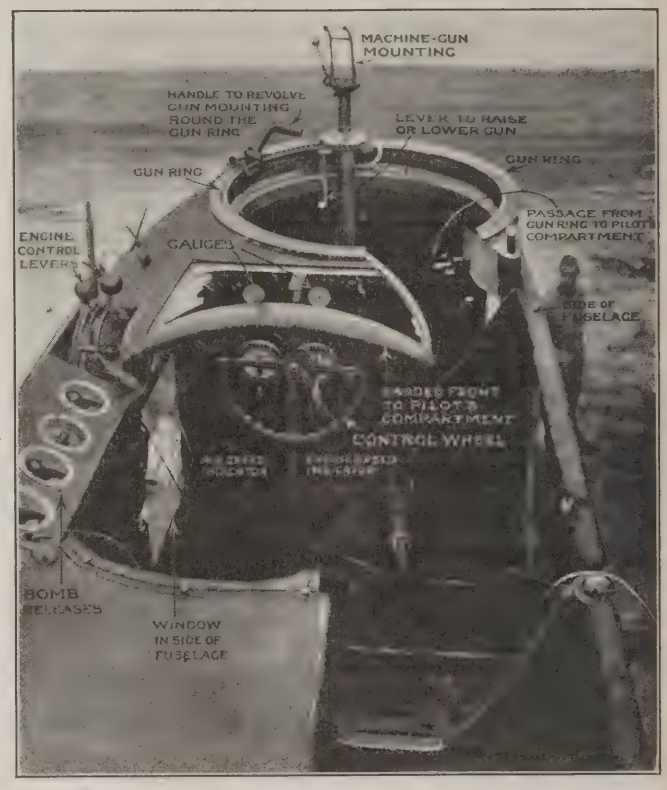
THE German Gotha biplane has been found one of the most difficult machines to attack owing to the fact that it has practically no "blind spot" to prevent it from returning fire. In all ordinary aeroplanes there exists what is called a "blind spot," which means that there is a certain attitude that a pursued aeroplane gets into which makes it impossible to fire at its pursuer without blowing its own tail to pieces.

It has been customary for the pilots of scout machines to attack the big gun machines from a position just back of the tail of the machine. Thus the scout pilot was practically immune from machine gun fire because the tail of the large machine shielded all the vital parts of the attacking machine. In order to overcome this disadvantage the designers of the Gotha have originated the "gun tunnel" a vault-like recess in the bottom of the fuselage which permits a machine gun to sight the most vital parts of any machine that might elect to attack it from the rear. At a short distance the tunnel is hardly visible, making it especially treacherous to unsuspecting attackers who attempt to get under its tail in the usual way.

The diagrams show how the Gotha is equipped and operated. In the extreme forward end of the fuselage a gunner-observer is placed with a machine gun which has a fairly wide range of action. Behind him, on the fuselage floor, two large bombs are held in quick-release clamps. The pilot is located just forward of the planes, and behind him, between the planes are two bomb-racks holding a dozen bombs one above the other, weighing about 50 pounds, with mechanism which releases them one after another as desired. At one side of the pilot and bomb-racks a passage allows the observer to leave his post forward and reach to "gun tunnel." The after gunner's seat is located above the gun tunnel opening and does not interfere with the gun-tunnel operator who lies prone on the fuselage floor to work the machine gun. So it will be seen that three machine guns are carried and operated by either two or three gunners.

The top plane is in two sections, joined at the center where it is connected to struts running up from the fuselage. The lower plane is in three sections, the central section running below the fuselage between the two motors, and the outer sections joined at the outer side of the motor housing at either side. These outer sections, as well as both upper sections, are swept back at a slight angle. The lower plane section between the two motors is at right angles to their axes.

The main wing beams are of I section. The ribs are at right angles to the spar, and consequently at an angle to the flight path. This method of running the ribs has the effect of offsetting the interplane struts, causing the rear struts to be out of line with the forward struts.



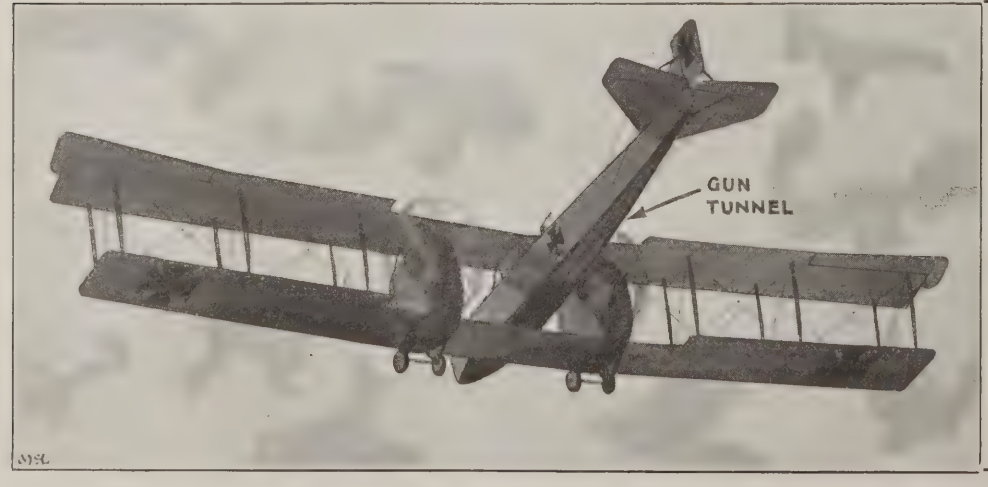
The cockpits for the pilot and forward gunner of the Gotha biplane, showing the passageway between the forward cockpit and the rear compartments

The fuselage is of rectangular section, covered with veneer at the forward end and linen at the rear. The four longerons are of ash and the cross members are of spruce. The landing chassis is composed of a pair of V struts and landing wheels beneath each motor compartment. Streamlined steel tubes are used for the Vs.

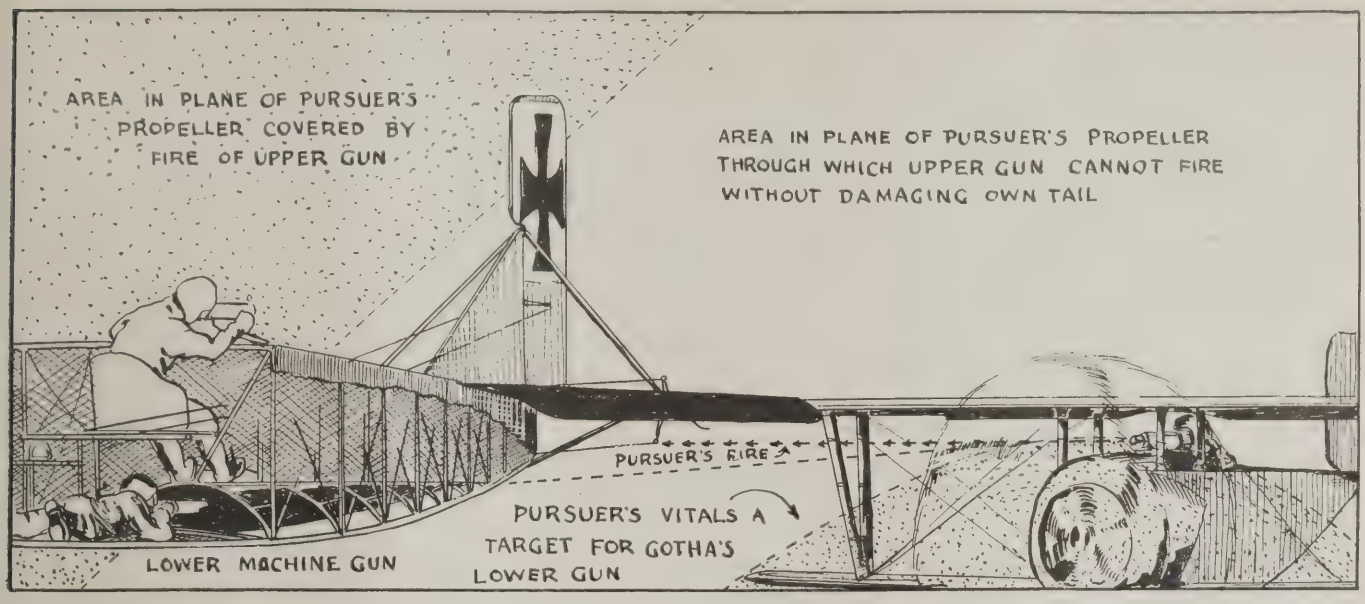
Portions of the planes are cut away for the propellers. A pair of ailerons are located on the upper plane, their ends and a balancing surface projecting beyond the wing. The span of the upper plane is 78′ 0″; lower plane, 72 feet. The chord is 7′ 6″ and the gap, 7′ 2″. Length overall, 41 feet.

The motors are encased in nacelles resting on the lower plane, with tube V supports running to the upper plane. The motors are 6 cylinder vertical Mercedes each developing 260 H.P. at 1400 r.p.m. The cylinders have a bore of 160 mm. (6 5/16″) and the pistons have a stroke of 180 mm (7 3/32″). Radiators are built into the front end of the motor housings, and the oil tanks placed under them. The spaces under the motors are occupied by the main fuel tanks.

Aside from the ingenious gun tunnel, interest in the

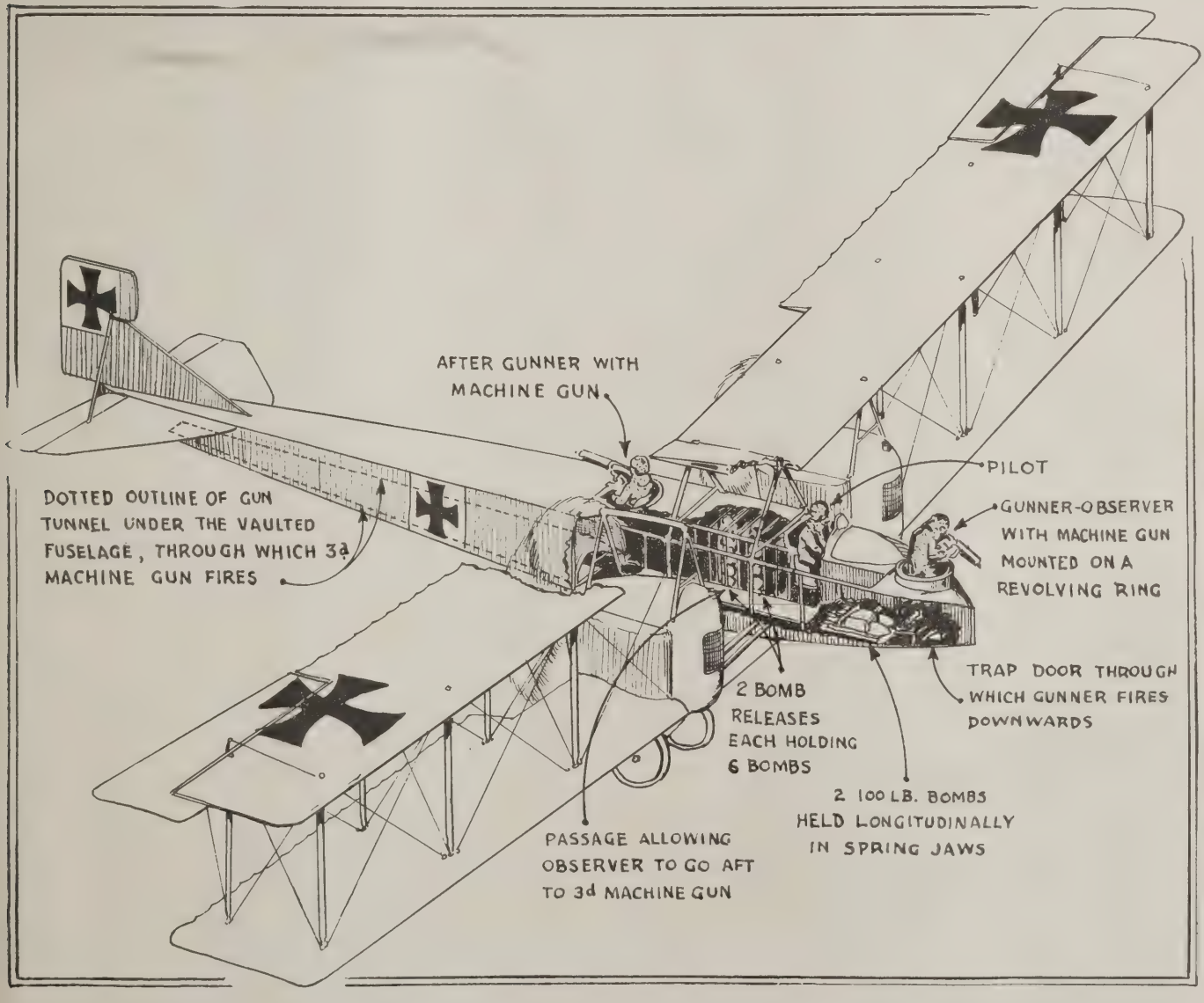


The giant twin-motored Gotha as seen from below. The arrow indicates the "gun tunnel," which has been used effectively in defence when attacked from the rear



Gotha has grown from the fact that it has carried out a number of damaging raids over England, and it is the largest of the German machines. The British Handley-Page biplane has undoubtedly furnished the data upon which the Gotha was designed, although the Handley-Page is a twin tractor and the Gotha a pusher. In our issue of August 13th, we gave a line drawing and a short description of the Gotha, and the Mercedes motors with which they are equipped were described in detail in the September 17th issue. The Mercedes motor develops 260 H.P. at 1,400 r.p.m. The bore and stroke is 260 mm by 180 mm. The six cylinders are cast separately and grouped in two sets of three each.

The Gotha bombing machine is regarded as most effective when it is in a position to deliver an overwhelming machine-gun fire upon a small number of attacking aeroplanes, but when it is attacked by an equal number of guns carried separately by swift and easy-manoeuvering fighting planes it becomes less formidable and a comparatively slow target.



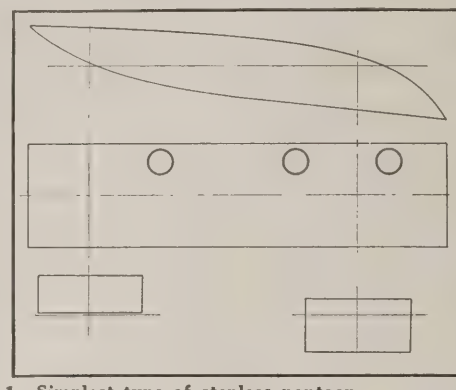
FLOATS AND HULLS FOR FLYING BOATS

By DWIGHT S. SIMPSON, M. M. E. Palmer-Simpson Co.

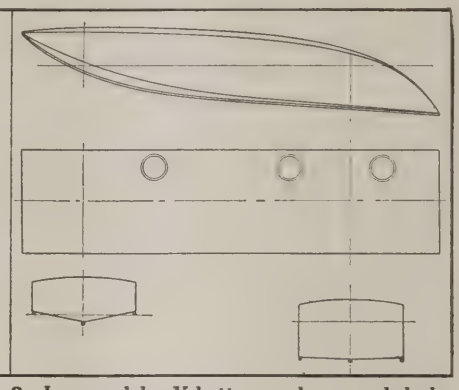
NOW that we are to spend so much money for coast defence and as much of it is likely to go into flying equipment, interest in water landing gear is becoming more wide spread. Most flying men would rather try out a new machine over water than land, and a machine capable of landing on water seems more suitable for a sportsman's general use. For many reasons the demand for such machines is becoming greater all the time.

It is about eight years since the first machine got off the water and almost from the first development has been in two quite different directions, one school making the "flying boat" in which the fuselage and floating body are one, as distinct from the "seaplane" proper in which the wheels of the landing gear may be said to be replaced by water floats. The latter is again split into two divisions, the single and double float types. We will leave the flying boat for some other time and look into the mysteries of the seaplane float.

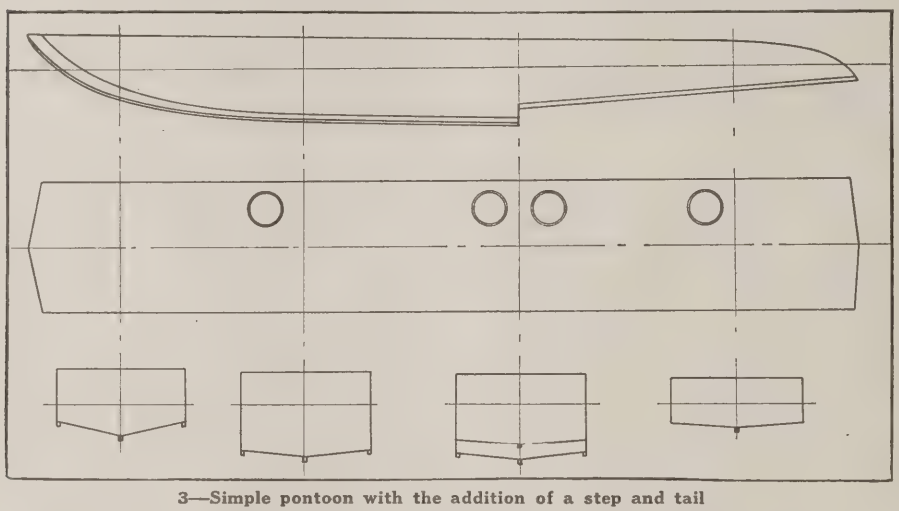
It is probable that both single and double float types will always be built as each fills certain requirements that the other will not. When the requirements call for speed in the air or a maximum of useful cargo space the single float will be used as it means less weight and air resistance for a given cubic capacity. For carrying torpedoes and large bombs the two-float system will be used as it provides considerable central space between the floats and the fuselage to hang heavy weights. Both have their disadvantages and their advantages in the water. The single float is unstable and requires small floats at the ends of the wings to keep the machine upright. These wing floats are not normally in the water, but as the machine heels they put a small planing surface



1—Simplest type of stepless pontoon



2—Improved by V-bottom and crowned deck



3—Simple pontoon with the addition of a step and tail

in and throw it back to an even keel. Some builders fit the wing floats with a small light board which acts like a spring leaf as it touches the water. The single float is very handy in smooth water, but unfortunately water at sea is rarely smooth and the wing floats are liable to get buried in a wave and the resulting strain is apt to rack the wings badly.

While the two-float system is more apt to yaw due to one float being temporarily submerged by a wave, the strain can be all taken up by the chassis and fuselage structure, thus leaving the wings undamaged. A greater margin of safety is provided by two floats as it is easy to make each large enough to support the entire machine in case the other is damaged. Practically this is accomplished by giving each float about 75% to 90% reserve buoyancy and then dividing it into several watertight compartments. The single float has from 110% to 125% reserve buoyancy.

Almost every form of float has been tried in the effort to find the ideal and until recently the hand of the naval architect was conspicuous only by its absence. Even the knowledge gained by ten years of hydroplane racing was little used. Today the most efficient forms are directly adapted from hydroplane design with such modifications as tank and practical experiment have found necessary to fit the float to its work. The sketches herewith show the forms most in use today.

Besides its work as a hydroplane the float must be considered from the standpoint of its air resistance and the ease (or difficulty in many of the first ones) with which it can be raised out of the water. These influence largely its shape in all respects except the bottom. The above water portion of an ordinary boat is largely designed to keep out spray and solid water and to look well. In a sea-plane float we forget all these and design to get thru the air with the least resistance and to apply its wind pressure in the least objectional direction to the rest of the plane. The nearest we can come to a stream line form the better the job we have.

We design our float then from three positions as it were. First in the water we want a certain planing speed. By intelligent adjustment of the weight, power and planing surface the float or floats may be made to plane at approximately any desired speed. This speed is about that at which the aeronautical engineer has decided that the machine will fly. Unfortunately for us who design floats he has also fixed the weight and decided upon the engine. We have therefore only one variable; the beam of our float. It is well to remember that it is not wise to plane too soon as the wings may not have taken charge—especially when running down wind—and there is neither pleasure nor profit in hopping about from sea to sea, "porpoising," as they appropriately call it. It is well therefore to have the planes carrying some weight before the float reaches its maximum speed in the water.

Thanks to Mr. Linton Hope we can very closely estimate this speed for any set of circumstances. He has evolved a formula for seaplane use which may be put as follows:

$$\text{Speed in knots} = \sqrt[2.4]{\frac{P.C.L.^{7}}{W}}$$

in which a knot is 1.15 miles

P is E.H.P. of engine

C is $138950 - \frac{B}{L}$

L is length (in feet) of pontoon to step

B is beam of pontoon in feet

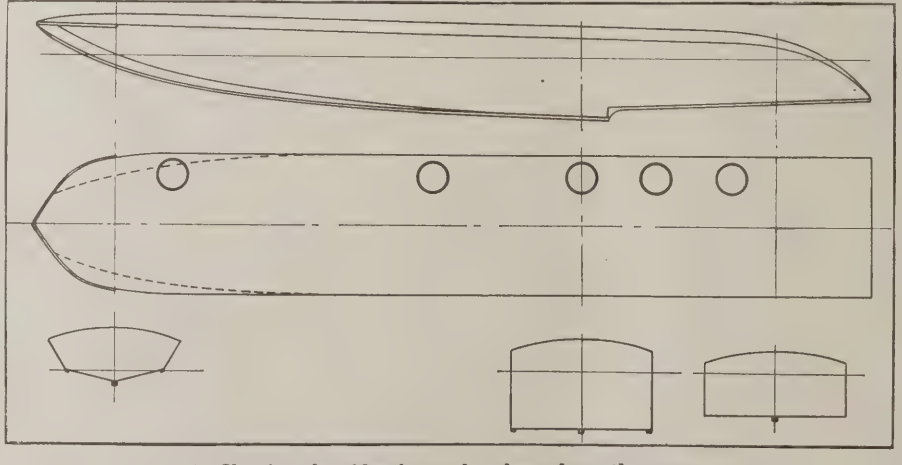
W is weight in pounds of complete machine and crew.

From an inspection of the above it is seen that we can control the speed largely thru modification of the beam. In the two-float system the combined beam of the floats should be about 25% more than given by the formula.

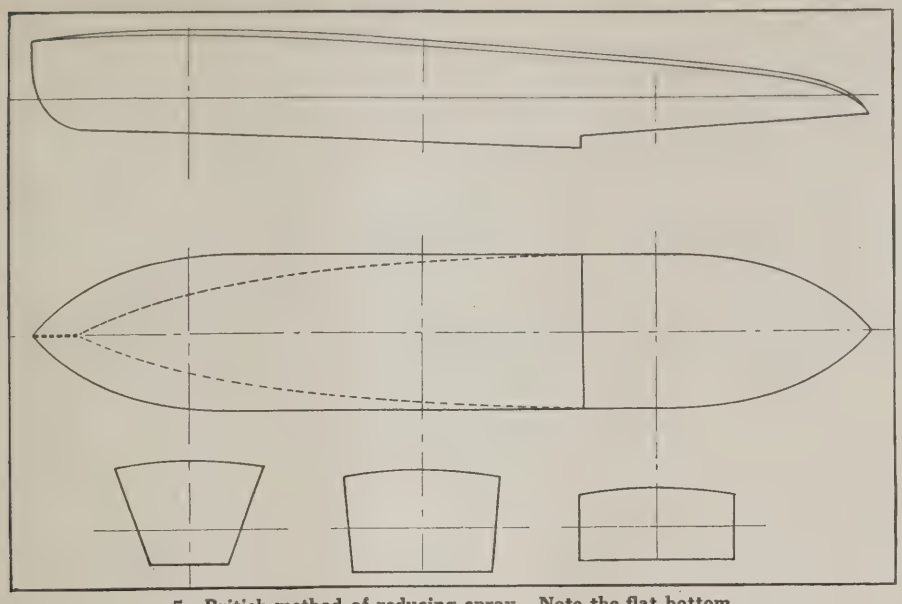
When in the air, floats of any form cease to be of use and become mere impedimenta and therefore require special consideration to make them as little obtrusive as possible. Much money has indeed been spent in an endeavor to make collapsible floats which can be taken in when in the air. The difficulty seems to be that they collapse at the wrong time and generally in the water.

Weight is the first item of interest after form and this is largely a matter of construction tho the Richardson float combines the most favorable lines with respect to air resistance and the lightest possible section from the builders standpoint. The usual boxlike form is not in itself either strong or rigid but forms merely the watertight covering of an intricate system of truss work. It is therefore a heavy boat to build. My friend Mr. Archibald Black has reviewed a number of floats of this type and says that the average weight of a pontoon is .089 pounds for each pound of its total submerged displacement. In the Richardson type this appears to be about .073 lbs.

The floats must be so hung that their actual air resistance is not converted into an undue



4—Slanting the sides forward to keep down the spray



5—British method of reducing spray. Note the flat bottom

number of footpounds influence on the airplane as a whole and so requiring too much inclination of the horizontal tail planes. This, however, as well as the balancing, is up to the aeronautical engineer.

The most critical test of the form of a float is at the moment of leaving the water, as this is the most difficult condition it has to face. Many an inexperienced designer has brought his new seaplane up to the speed where his figures have told him that the next increment will lift it from the water, only to feel something wrong and settle back for a new try. Perhaps there are dozens of trys before getting away and it has often happened that he didn't get off the water at all. The plane might have been a wonder but the floats were but boxes stuck on to support it for a moment only.

It has been found that water has a peculiar affinity for curved surfaces but dislikes to follow around a sharp corner. It would seem politic therefore to join all surfaces that are below the water, when the plane is moving, with a sharp corner, and to make all surfaces flat or possibly convex (the corners are sharper then). The water will then break from them and by letting the air to the surface will release the float. No one would think of making the corner of the step round and it seems obvious that all other corners should be as sharp.

Hydroplane designers long ago came to the so-called "V" bottom to obviate as much as possible the hard pounding of the waves. For the same reason it has been adopted on the later seaplane floats. It materially relieves the jar of landing, nor is the machine so liable to porpoise in getting away. When the bottom of the tail is "Ved" it seems to clear much easier than the usual flat bottom.

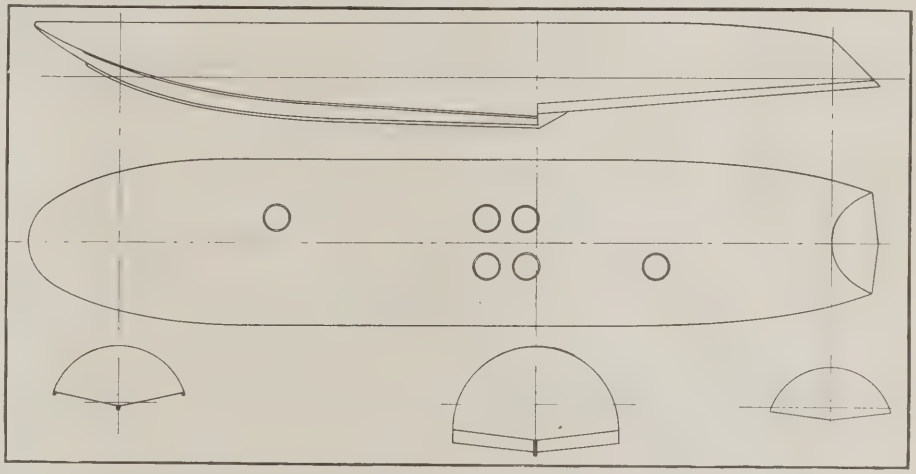
The step is an item that seems to puzzle many. Its explanation begins at the beginning of the hydroplane. A hydroplane is so called because it rides on the surface of the water instead of cutting thru it as a "displacement" boat does. It rides on the surface because the pressure of the water is converted into a vertical pressure on the bottom planes. In order to do this the planes must be set at a small angle to the horizontal line of advance (from three to five degrees). If this plane were continued to the end of the boat it would be very deep in the water and give unsatisfactory service. If it were rounded up toward the stern there would be cause for squatting, therefore it is broken off sharp and the boat is moving so fast that the water breaks right away from it and does not make an eddy retarding the speed. To assist the operation and prevent a vacuum behind the step air is led in thru tubes or "breathers" which extend from just behind the step right thru the boat. The step need not be more than three inches deep. Now a hydroplane may be, and is, built with one step, two steps, many steps, or none. So may one build an airplane float, but because the airplane has to leave the water and to do so must rock slightly about its center of gravity, more than one step is not entirely practical, and if the float is not more than ten or twelve feet long, it is better without any.

To avoid carrying that tail float most of us build on more float behind the stern and have what is generally known as a one step float. Technically, however, we still have a stepless hydroplane with one planing surface. The bottom of the tail, or that part of the float behind the "step" is slanted upward toward the stern in order to clear it from the water as soon as possible and allow the machine to rock about the step in getting away. At no time does this part of the float assist in planing, and its sole use is to keep the machine from falling over backward when it is at rest in the water.

As another step spreads the waterborne area from two to three feet and makes the rocking of the machine difficult it may safely be said in view of the above that practically all seaplane floats and flying boats are stepless hydroplanes. There are a few others of course to "prove it."

Just as we want sharp corners and flat surfaces below water so we want round corners and well rounded surfaces above. They are lighter and stronger to build and allow all water which comes up over the top (and there will be a lot of it) to roll off as quickly as possible. When we come to the ends all that is necessary is to shape them so that the bow will enter and the stern will leave the air without making eddies, which cause resistance. In a word, streamline them.

The fittings require some consideration as it is possible to add considerable weight to the float by badly designed articles. Each watertight compartment requires a light bronze drain plug in the bottom, which must be smooth on the outside, and a handhole plate in the deck directly over the drain plug, which opens from the inside. The handhole plate should be about four inches in diameter and be made of aluminum. While aluminum is quickly corroded by seawater, the process is retarded by boiling the fittings in linseed oil, so that they will last as long as the rest of the machine. A towing ring should be fastened in the bow and all edges which are apt to wear on the runways should be bound with thin sheet brass. The strut fittings, by which the float is fastened to the fuselage of the plane, are, of course most important. They should be made of a high grade bronze or of steel.



6—The best American practise today—the Richardson float

The step should be located not more than, say, three feet behind the center of gravity of the entire machine (to permit of rocking) and this means that the stern of a stepless float comes at that location. We therefore find it necessary to put a small float under the tail to hold it out of the water when the plane is at rest. This lifts nearly as soon as the machine starts but still provides considerable wind resistance and is not desirable. The main float must be made to project far enough forward to guard against tipping over that way, tripping, a sailor man would call it.

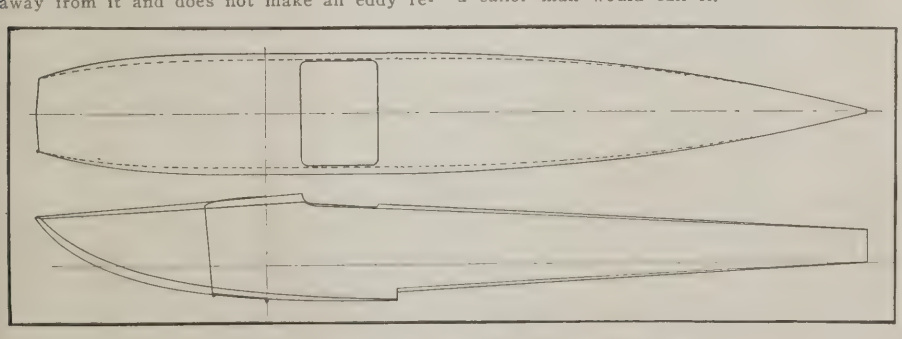
The outside lug that takes the strut end should have a solid fastening to the inside of the float and be carried down in such fashion that the bottom is supported both in compression (carrying the weight when the machine is on the water) and in tension (being carried by the struts when the machine is in the air). This can best be accomplished by means of solid bulkheads which can also be made watertight. One or two concerns have lately been experimenting with shock-absorber connections but with the use of the "V" bottom this would seem a refinement for sportsmen's use only.

The accompanying sketches are intended to illustrate the foregoing remarks and to show the prevailing types of floats in present use. There have been many others, and there will doubtless be more of shapes yet undreamed, but so far as is now known it is unnecessary to go beyond those general types here shown.

Sketch No. 1 shows the simplest type of actually stepless pontoon. Most of its shape is in the profile as the top and bottom are flat surfaces brought together at the ends to provide proper stream lines. It is cheaply constructed due to its flat sections and for the same reason is fit only for experimental work. (Experimental with respect to the plane, not the float.)

Sketch No. 2 is the same thing improved for permanent work by the use of "V" bottom

(*Continued on page* 82)



7—A typical flying boat hull with flat flaring sides

THE HIGH-TENSION MAGNETO WITH SPECIAL REFERENCE TO THE IGNITION OF AEROPLANE ENGINES

By A. P. YOUNG, A.M.I.E.E., A.I.A.E.

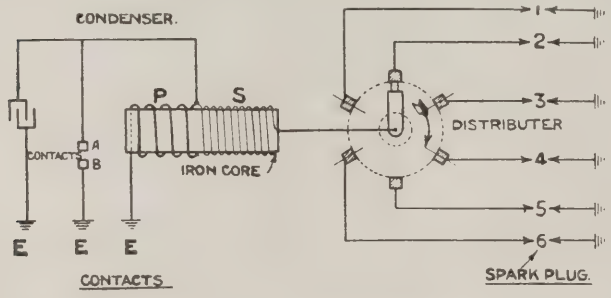
PART I

(1) Foreword

Early in 1915 I had the honor of delivering to one of the largest Engineering Societies in the Midlands, a lecture* on "The High Tension Magneto," which is—superficially at least—familiar to all those associated with the Aeroplane and Allied Industries. The present paper is really a continuation of my earlier effort, and, being presented to an Aeronautical Society, I shall naturally make special reference to the high-tension aeroplane type of magneto. The amount of technical literature on this subject available at the present moment is very meagre. It is therefore hoped that this contribution will have the effect of initiating a healthy discussion of ignition problems and stimulating the interest of all members of the engineering industry who are either directly or indirectly interested in the matter.

The degree of success achieved in the development of the combustion motor has at all stages been primarily dependent upon the efficiency of the ignition system used, and it is no exaggeration to say that the rapid strides which have, during recent years, been made in the construction of the petrol motor, *per se,* have mainly resulted from the very satisfactory high-tension ignition system that has been available. It is fundamentally true—although perhaps a mere commonplace—to say that the most perfect engine mechanism is of little use if the ignition system be faulty.

During the last two decades we have witnessed the birth and subsequent healthy development of high-tension ignition in the form of the magneto, and the wonderful efficiency of this system, coupled with its extreme flexibility—enabling one magneto to cope with almost any number of cylinders—is primarily responsible for the enormous developments that have taken place in the application of the petrol motor to industrial



NOTE:-
FOR CONVENIENCE, A 6 CYLINDER DISTRIBUTER IS ILLUSTRATED.
IN GENERAL, THE NUMBER OF DISTRIBUTER SEGMENTS IS EQUAL TO THE NUMBER OF CYLINDERS.

FIG. 1.

and—in more recent times—war purposes. Without the high-tension magneto it is almost certain that the aeroplane would never have reached its present high state of development, and—if I may be allowed to digress—it is reasonable to assume that the whole course of the present disastrous war would have been different, and much less in our favor—if the military critics are to be believed.

Prior to the outbreak of war the number of high-tension magnetos being produced in this country formed a negligible proportion of the total number being used for a variety of purposes. Through laxity on our part this most vital "key" industry was allowed to develop in Germany, but one is happy to know that the war has taught us a lesson in this respect and that our motto as a nation in the future will be "never again." During the period of the war the magneto industry in this country has developed at a really wonderful rate, and all those participating are to be congratulated—and indeed the country is indebted to them—on the present healthy and hopeful state of the industry.

You can judge what has been done when I state that the British Ignition Apparatus Association—which has been formed mainly as a result of the efforts of Mr. P. F. Bennett, the Chairman and Mr. E. Garton, the Secretary—is at the moment supported by ten British magneto manufacturers who have, during the period of the war, supplied to the Government for war purposes, and chiefly for aeroplanes, no less than 200,000 magnetos. Furthermore, I think it is agreed by those in a position to judge that the British magneto as at present constructed is the equal of the pre-war Bosch magneto emanating from Stuttgart, which is sufficient testimony that the British manufacturers have done their duty. I can go further and state, from first-hand knowledge, that certain developments now taking place will result in the British manufacturers producing new types of magnetos that will prove to be vastly superior to anything turned out of Germany in the past.

I would therefore plead that when the war is over the British magneto manufacturers be given to the full encouragement and support by Government and public alike, so that there may be established on a solid foundation a British magneto industry that will endure through the years to come—an industry producing magnetos and ignition apparatus for aeroplanes, motor-cars, and other purposes, of superlative quality and design, not surpassed by anything manufactured outside of these little Isles.

*Lecture delivered to the Coventry Engineering Society.

(2) Historical

All electrical systems of ignition are direct descendants of Faraday's great discovery of electro-magnetic induction made during the autumn of 1831, when for the first time in the world's history he succeeded in producing a spark by electro-magnetic means. He was experimenting with his classical iron ring wound with primary and secondary when he found, to his great joy, that by either closing or opening the primary circuit, it was possible to obtain a tiny spark between two carbon pencils separated by a very small distance and connected to the ends of the secondary.

The first system of electric ignition ever used was devised by Lenoir in 1860. He utilized the high-tension spark of a Ruhmkorff coil for ignition purposes, employing a high-tension distributor for connecting the secondary winding first to one plug and then to the other. It is worth noting that the modern battery system of ignition now used most extensively in America is strikingly similar to the old Lenoir system, even to the detail of introducing an extremely small air gap between the rotating metal brush and the distributor segment—a method of distribution that is now being followed on magnetos. Lenoir was also the inventor of the spark plug, and the type of plug which he designed for use in conjunction with his ignition scheme of 1860 had all the features of the modern spark plug.

Marcus appears to have been the first man to construct a magneto for ignition purposes. His was a low-tension machine, having the now familiar form of H armature, the current induced in the winding being broken at predetermined times in the cylinder by a system of cams and levers.

In 1898 Simms and Bosch developed a low-tension magneto, using a fixed H armature and rotating segments for producing the necessary flux changes in the armature core. This is of special interest, because subsequently, by the addition of a secondary winding on the same armature core, a high-tension magneto was evolved. Later on I shall have occasion to describe in considerable detail a magneto of this particular type which is being built in very large quantities for aeroplane work.

The Bosch Company, of Stuttgart, Germany, must receive the credit of having thoorughly established the fact that a high-tension magneto can be manufactured on a commercial basis, to give reliable and efficient ignition in practice. Although this important industry was allowed to develop in Germany, the modern H.T. magneto was first conceived in France by the Frenchman M. Boudeville,† who unfortunately omitted to include a condenser in his scheme for eliminating sparking at the contact points.

A condenser is a vital part of every magneto; without it the machine would be quite impracticable. It is surprising that Boudeville should have overlooked this feature, because here again the idea of using a condenser for such a purpose is of French origin, the Frenchman Fizeau being the first to suggest, in 1853, connecting a condenser in parallel with the contacts on a Ruhmkorff coil, to prevent excessive sparking.

(3) Fundamental Considerations

Any form of high-tension magneto consists of four essential parts:—

(1) A magnet system.
(2) An iron core wound with primary and secondary.
(3) A contact breaker to interrupt the primary circuit at predetermined intervals.
(4) A high-tension distributor.

The arrangement of connections generally adopted is clearly illustrated in Fig. 1. The earthed primary contact (B) is actuated by some form of cam so that the primary circuit is continually being closed and opened.

The iron core which carries the armature windings may either revolve or be fixed. In the latter case the rotor comprises certain iron masses so disposed that every 90° or 180° (depending upon whether the magneto is a two-spark or a four-spark), the flux flowing from the N pole

†See "Magneto for Electric Ignition," by H. Armagnat, in "La Revue Electrique"—Translation in "The Electrician," March 24th and 31st, 1916—which deals fully with the history of Electric Ignition.

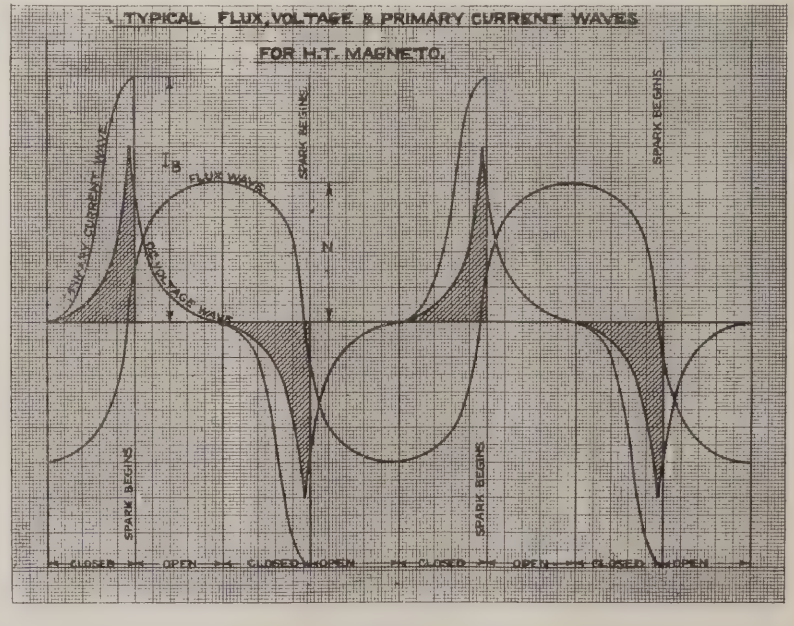


FIG. 2.

of the magnet to the S pole, through the armature core, is suddenly reversed.

When the armature rotates the flux reversal occurs—except when specially-shaped poles are fitted—every 180°, and the magneto gives two sparks per revolution.

Magnetos provided with stationary armatures are said to be of the inductor type. To prevent confusion we shall adopt the following nomenclature:—

(1) When the rotor comprises iron segments built in the form of a sleeve, which revolves around the stationary armature, we shall call the machine a "Sleeve Inductor" type magneto.

(2) When the rotor comprises iron masses operating in conjunction with an external armature core, we shall call the machine a "Polar Inductor" type magneto.

(3) When the armature rotates—as is more usually the case—we shall call the machine a "Rotating Armature" type magneto.

Dealing first with the problem in the abstract, we give below a description of the cycle of operations that is applicable to any particular construction. Reference should be made to Fig. 2, which shows a typical flux wave, and the resultant open circuit voltage and primary current waves.

(*a*) The rapid reversals of flux in the armature core induce in both primary and secondary an alternating E.M.F., the maximum E.M.F. being reached for any given speed, when the actual flux in the armature core is substantially zero.

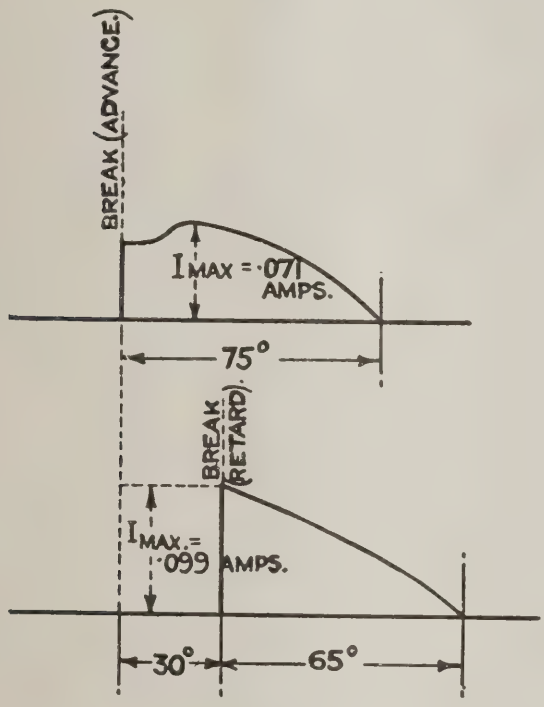


FIG. 3.

(*b*) The cam operating the contact breaker lever is so designed that the primary circuit is closed during the period when the induced voltage is growing from zero to its maximum value, and for some little while afterwards, but not until the voltage has become zero again.

(*c*) During the period of closure of the primary circuit the induced current will steadily increase in value. Then at a certain instant the contacts are suddenly separated by the cam. The condenser in parallel with them ensures that there is no sparking at this instant, so consequently the rupture of the primary current is remarkably sudden.

(*d*) The sudden rupture of the primary current causes an instantaneous collapse of the magnetic field associated with it, and as this field is linked with the secondary turns, an enormous voltage is induced in the secondary winding at this instant. This voltage is sufficient to initiate a spark between the electrodes of the spark plug, and this spark is maintained, to some extent, by the voltage induced in the secondary by virtue of the continual flux change in the armature core produced by rotation during the period that the contacts remain open. (See Fig. 3.)

(*e*) After a certain short interval of time the cam allows the contacts to close again, and the cycle of operations (*b*) (*c*) (*d*) is repeated.

(4) Analysis of the Working of a Magneto

From the foregoing description of the cycle of operations we can easily set down the factors which govern the operation characteristics of any H.T. magneto:—

Maximum value of flux through armature core $= N$.

Angle during which contacts remain closed (measured on revolving shaft) $= \theta_1$.

Angle during which contacts remain open $= \theta_2$.

$$\text{Ratio } \frac{\theta_1}{\theta_2} = k$$

No. of primary turns $= S_1$.
No. of secondary turns $= S_2$.

$$\text{Ratio } = \frac{S_2}{S_1} = k_1$$

Value of primary current at "break" $= I_B$.
Self-induction of primary at "break" $= L$.

Other things being equal, the voltage induced in the secondary winding at "break," and the amount of energy liberated in the H.T. spark, are dependent on I_B. The best results are therefore obtained when, for any speed over a very wide range, I_B corresponds to the maximum point on the primary current wave. Unfortunately, this result cannot be achieved in practice, because if I_B is a maximum at low speeds, the current broken at high speeds (for the same timing) will be less than the maximum, and *vice-versa.*

Theoretically, the whole of the energy stored up in the primary winding during the periods when the contacts are closed and the primary current is creating a magnetic field should reappear in the secondary spark at "break" if there were no losses. This energy, which is stored in the primary at a low potential, is, as it were, suddenly thrust into the secondary at "break," where it reappears at a high potential. Actually, certain losses occur during the transfer, and only a portion of the energy stored magnetically (amounting to $\frac{1}{2}LI_B^2$ Joules) appears in the H.T. spark. Generally speaking, about 80% of this energy is available for ignition in a well-designed magneto.

The problem, then, is to determine the value of I_B. If we know the formation of either the flux or voltage wave as given in Fig. 2, this can be easily done. The flux wave can be deduced experimentally by what is called a "point to point" method. That is, a fine search coil is wound on the armature windings (or the primary itself may be used if the turns are known) and connected to a ballistic galvanometer. By moving the rotor through a large number of consecutive and equal angles (say 15°), noting the deflection of the galvanometer corresponding to each movement, the corresponding flux changes can be calculated and from these figures the flux wave deduced.

Having a flux wave, the E.M.F. wave can be calculated from the formula:—

$$e = \frac{-S_1}{10^8}\frac{dN}{dt} \text{ volts} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Another method is to determine the E.M.F. wave on open circuit, experimentally, by using an oscillograph, and calculate the flux wave by applying this same formula re-written as follows:—

$$N = \frac{-10^8}{S_1}\int e.dt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Assuming that the E.M.F. wave for any given speed is known, the value of I_B can be determined by the graphical method which I have developed elsewhere.* I shall recapitulate.

In general, we can represent the growth of the primary current during the period when the contacts remain closed by the following fundamental formula:—

$$e = ri + L \cdot \frac{di}{dt}$$

Where,
e = Instantaneous voltage induced in primary circuit as determined from the curve, such as that shown in Fig. 2.
i = Instantaneous value of the current in the primary. Amps.
r = Resistance of primary. Ohms.
L = Self-induction of primary at the instant under consideration. Henries.

Integrating this equation we get:—

$$L\ (_iT_2 - {}_iT_1) = \int_{T_1}^{T_2} e.dt - r. \int_{T_1}^{T_2} i.dt$$

If $(T_2 - T_1) = T$ is small, then we get approximately:—

$$L\ (_iT_2 - {}_iT_1) = X - r.T\ \frac{(_iT_2 + {}_iT_1)}{2}$$

Where
X = Area of voltage wave included between T_1 and T_2.

Finally,

$$_iT_2 = \frac{2X + {}_iT_1\ (2L - rT)}{r.T + 2L} \quad \ldots\ldots\ldots\ldots (3)$$

By using this formula and applying a point-to-point method it is a fairly easy matter to determine the primary current wave (and therefore I_B) for any type of magneto at any speed, provided that the constants of the design are known. Later on I shall refer to a series of curves for a sleeve inductor type of aeroplane magneto that have been deduced by this method.

It is possible to calculate I_B directly by making certain justifiable assumptions, and in one of the appendices to this paper I have developed a formula which can be used for such calculations.

Referring to equation (3), it should be noted that the factor X is proportional to the flux change in the armature core, due to rotation, that occurs in the short period of time considered. It is therefore easy to see that the current I_B, for any given design, is within limits proportional to the maximum armature core flux N, this in turn being dependent on the magneto characteristics and design of the magnet (or magnets) used. As the energy in the high-tension spark is proportional to (I^2_B), we must conclude that the energy liberated at each discharge (that is, the intensity of the spark, but not necessarily the power of the spark to produce ignition) is proportional to the *square of the maximum value of the flux produced in the armature core on open circuit by the system of magnets used.*

It is therefore evident that the magnet flux is one of the controlling factors in the design of any magneto, and very careful attention has to be given to the magnetic quality of the magnets and the design of the whole magnetic system to ensure that the best results are obtained. I shall deal more fully with this aspect of the problem under the heading "Magnets—Importance of Flux."

* "The H.T. Magneto," by A. P. Young, "Automobile Engineer," March, 1915.

(To be continued)

A NEW METHOD OF TESTING PROPELLERS*

By GUSTAVE EIFFEL

IN my work on the resistance of the air* I gave the logarithmic curves of the propellers tested in my laboratory, and a number of these curves were collected in a single diagram (*cf.* the *Atlas,* Plate XXXIX). This simple graph enabled one to make an easy selection of any of the propellers tested according to its specific thrust and efficiency. In due course I shall publish the results of my research work carried through since the outbreak of the war; but meanwhile it seems advisable to announce without further delay that in the diagrams referred to the values of $\frac{P_m}{n^3D^5}$ are usually too low and that, in consequence, the values of the thrust are too high.

The reason for this is that the curves of loading employed by me (*cf.* my book, p. 38) are not accurate enough. This, it seems to me, to be accounted for by the fact that in drawing up these curves I took as my basis a series of tests carried out at the Conservatoire des Arst et Métiers on fans working from a fixed position and in the open air. If these fans are tested for a static test in the laboratory, they would probably not absorb the same amount of power as in the open air. The proximity of the ground, of the diaphragm, and of the base of the balance must affect the displacement of the air. This, by the way, is not the case, as I can confirm from experience with my motion tests on propellers, for there the disturbance set up by the rotation only affects the central position of the cylindrical column of air passing through the test room.

Hence, since my previous work was published, a new method of loading has been devised by installing a dynamo as a brake for the motor driving the propeller. The appended photograph shows the propeller shaft coupled up to a dynamo bedded on a heavy support designed to eliminate vibration. The loading curves of this dynamo give the values of the mechanical energy expended on the dynamo shaft as a function of the electrical energy produced by the dynamo. Hence it was possible to determine as a function of the number of revolutions the value of the mechanical power expended on the propeller shaft by reading a wattmeter attached to the dynamo. Simultaneously, from a wattmeter attached to the propeller shaft, it was possible to read off the electric power furnished to the motor driving the propeller. By this means I was able to draw up the loading curves for the latter, which give the mechanical power on the propeller shaft as a function of the electrical power delivered for any number of revolutions.

In Fig. 2 are shown the loading curves for 30, 40 and 50 r.p.sec. For instance, at 40 r.p.sec. the electrical energy supplied at the motor and indicated by the wattmeter being 650 kilogramme-seconds, the power absorbed by the propeller was 575 kilogramme-seconds, which is the value of P_m in the new graphs.

I have verified the accuracy of these curves by a new practical testing method, by means of which I intend to investigate the results of two propellers working one behind the other.

For this purpose I again tested several propellers, already referred to in my previous work, by means of apparatus previously used and similar to that installed in my laboratory at the Champ de Mars. In this the couples are directly measured by weights suspended from a lever-arm connected to the motor. The figures thus obtained are identical with those found with the electrical loading device.

I deem it advisable to bring to the notice of the staffs of aerodynamical laboratories undertaking research work on propellers of the same type, and also aircraft constructors intending to use these propellers, that the tables given in my previous work should be replaced by those appended to this article.

The values of P_m, ρ and $\frac{P_m}{n^3D^5}$ which appear in the present tables replace those given in the numerical tables (*vide* my *Atlas,* pp. 49-63). In order to facilitate reference to the numerical tables, the first column gives the speed.

From the values of P_m are deduced those of $\frac{P_m}{n^3D^5}$

Finally, ρ is calculated from the ratio $\frac{P}{P_m}$, P being the useful power FV and F the thrust and V the speed of the wind.

The values of F, P, $\frac{V}{nD}$ and $\frac{P}{n^3D^5}$ remain the same.

Example: D = 1 m.; n = 40 r.p.sec.; V = 27.8 m.p.sec.; P_m = 575 kilogramme-seconds.

$$\frac{P_m}{n^3D^5} = \frac{575}{(40)^3\times(1)^5} = 0.00899$$

$$\frac{P_m n^2}{V^5} = \frac{575\times(40^2)}{(27.8)^5} = 0.0556$$

$$\frac{P_m}{V^3D^2} = \frac{575}{(27.8)^3\times(1)^2} = 0.0268$$

$$\rho = \frac{P}{P_m} = \frac{430}{575} = 0.747$$

2. I have revised the general graph ("Atlas," Pl. XXXIX), giving the logarithmic curves of the principal propellers tested in the laboratory. I desire to point out once again that from this diagram it is possible to read without calculation the unknown factors of each airscrew. The accompanying figure gives two examples of propellers: one for an aeroplane, the other for an airship. By means of this diagram it is possible to select a suitable propeller for any given case according to the thrust developed. For instance, for the aeroplane propeller screws No. 11 (diameter 2.55 metres) and No. 24 (diameter 2.75 metres) are preferable, giving an efficiency of 0.75 and 0.74 respectively.*

In the case of airships the diameter of the propeller is generally known, and the number of revolutions has to be determined. In this case also screws Nos. 11 and 24 are the most suitable, for they have an efficiency of 0.72 at 467 and 520 r.p.m. respectively.

It will be seen how simple and practical is this method, which is applicable to all propeller characteristics.

3. On the other hand, it should be noted that in selecting an aeroplane propeller at least two conditions of flight should be taken into account: horizontal flight near ground level and climbing or flight at great altitudes.

In the former case, for a family of airscrews only differing in their pitch, the one with the largest pitch, and therefore with the smallest diameter, is to be preferred. But on the other hand, it is well known that these propellers become very inefficient at low flying speeds and that they differ in this respect from propellers with a smaller pitch and larger diameter.

Again, the useful power also depends on the motive power, which is regulated by the number of revolutions. Propellers with a small pitch have their number of revolutions reduced to a greater extent at low flying speeds than large pitch propellers. The question is therefore distinctly complicated. It is considerably simplified by my diagrams, but a full explanation of this delicate matter I intend to reserve for my next book.

It will show, by using the same logarithmic curves, that it may be desirable to sacrifice motive power to some extent at fast flying speeds by throttling down the motor in order not to exceed the limiting speed of the motor when a small pitch propeller is used. If that is done, the same propeller can be made to turn at a greater number of revolutions, therefore obtaining increased power, at slow flying speeds.

It should also be noted that the reduction in the flying speed near ground level is roughly proportional to the cubic root of the reduction in the corresponding useful power, while the increase in vertical climbing speed is equal to double the increase in useful power (for a machine having an excess power coefficient of 2).

In other words:.

(1) By reducing the useful power in horizontal flight near ground level by 10 per cent the speed only decreases by 3.5 per cent.

(2) By increasing by 5 per cent the useful power for climbing (with excess power coefficient = 2) the increase in vertical speed amounts to 10 per cent.

Nouvelles Recherches sur la Résistance de l' Air l'Aviation; 1914.

* Propeller No. 19 gives the same efficiency, but cannot be used on account of the thinness of its blades as stated in my original work.

There is one further point to be taken into account in designing a propeller: the effect of the slip stream on the parts of the machine in front or behind the propeller.

The acceleration of the air is a function of $\frac{F}{V^2D^2}$, and decreases as the diameter is increased. Consequently, in order to employ large diameters, one will have to have recourse to screws of low power—that is, with a low value of $\frac{P_m}{n^2D^5}$

NUMERICAL TABLES GIVING THE REVISED VALUES OF P_m, ρ AND $\frac{P_m}{N^2D^5}$

Propellers Tested	n t/sec	Speed m/sec	Horse-power Pm kg m/sec	Effi-ciency ρ	$\frac{Pm}{n^3D^5}$
No. 1 Diameter: 0·80 m (Pl. XXXI, p. 50)	50	8·32	263	0·430	0·00633
		11·03	248	0·524	0·00597
		14·30	229	0·605	0·00551
		18·56	182	0·664	0·00433
		21·20	150	0·613	0·0036
No. 2 Diameter: 0·80 m (Pl. XXXI, p. 50)	50	11·10	509	0·442	0·01225
		15·35	498	0·550	0·0120
		20·10	459	0·658	0·01105
		25·45	402	0·709	0·00969
		27·70	368	0·730	0·00887
No. 3 Diameter: 0·80 m (Pl. XXXI, p. 51)	40	10·76	340	0·45	0·0160
		15·65	323	0·583	0·0152
		20·1	300	0·667	0·0141
		23·9	254	0·732	0·01194
		28·25	204	0·70	0·00959
	50	11·27	686	0·393	0·01653
		15·46	668	0·498	0·0161
		20·85	630	0·611	0·01518
		25·65	578	0·671	0·01393
		29·15	506	0·684	0·0122
No. 4 Diameter: 0·80 m (Pl. XXXI, p. 51)	35	10·42	317	0·372	0·02165
		15·20	322	0·486	0·0220
		20·2	317	0·571	0·0218
		24·75	304	0·619	0·02075
		29·0	262	0·599	0·0179
	40	10·45	476	0·326	0·02182
		14·85	482	0·436	0·0221
		20·15	481	0·530	0·02205
		24·85	460	0·592	0·0211
		29·1	448	0·580	0·02053
No. 5 Diameter: 0·80 m (Pl. XXXII, p. 52)	40	8·68	247	0·405	0·01165
		11·3	242	0·463	0·01142
		15·33	225	0·511	0·01062
		19·80	196	0·411	0·00925
		22·95	170	0·195	0·00802
	50	10·62	475	0·408	0·01145
		15·15	456	0·500	0·011
		19·50	428	0·510	0·01033
		25·20	362	0·391	0·00872
		28·10	327	0·226	0·00788
No. 6 Daimeter 0·80 m (Pl. XXXII, p. 52)	40	10·53	388	0·428	0·0183
		15·00	371	0·544	0·0175
		20·05	346	0·619	0·0163
		25·10	293	0·589	0·0138
		28·15	253	0·502	0·0119
	50	11·05	753	0·360	0·01815
		14·90	741	0·457	0·01785
		19·45	710	0·543	0·0171
		24·90	660	0·605	0·0159
		29·30	587	0·610	0·01398
No. 7 Diameter: 0·80 m (Pl. XXXII, p. 53)	30	10·40	204	0·477	0·0228
		15·15	199	0·598	0·0222
		20·70	178	0·662	0·01988
		24·30	154	0·615	0·0172
		28·25	115	0·422	0·01285
	40	15·20	491	0·507	0·02315
		19·00	482	0·575	0·02272
		22·20	471	0·615	0·0222
		26·75	433	0·649	0·0204
		29·60	407	0·631	0·0192
No. 8 Diameter: 0·80 m (Pl. XXXII, p. 53)	30	14·75	254	0·547	0·0283
		19·20	240	0·637	0·0268
		22·95	228	0·673	0·0254
		26·25	214	0·666	0·0239
		29·45	198	0·565	0·0221
	40	10·80	640	0·363	0·0302
		15·85	661	0·473	0·0312
		20·25	658	0·553	0·0310
		25·15	640	0·630	0·0302
		29·25	621	0·660	0·0292
No. 9 Diameter: 1·00 m (Pl. XXXIII, p. 54)	30	10·40	211	0·547	0·00781
		15·10	188	0·667	0·00696
		18·40	159	0·701	0·00589
		22·65	105	0·643	0·00388
		25·70	58	0·0448	0·002145
	40	10·70	573	0·463	0·00886
		14·45	542	0·564	0·00847
		20·10	477	0·679	0·00745
		25·05	391	0·723	0·00611
		27·90	329	0·711	0·00514
No. 10 Diameter: 1·00 m (Pl. XXXIII, p. 55)	30	10·25	267	0·507	0·00989
		17·75	212	0·695	0·00785
		21·35	176	0·713	0·00652
		23·25	153	0·699	0·00567
		26·00	105	0·560	0·00388
	40	11·00	665	0·454	0·01038
		15·00	639	0·562	0·00998
		19·30	606	0·645	0·00947
		25·40	514	0·723	0·00803
		28·00	445	0·732	0·00695
No. 11 Diameter: 1·00 m (Pl. XXXIII, p. 55)	30	10·38	308	0·513	0·01158
		14·90	296	0·642	0·01133
		19·10	252	0·726	0·00947
		24·20	191	0·733	0·00718
		27·20	152	0·681	0·00571
	40	10·85	747	0·440	0·01183
		14·90	732	0·553	0·0116
		20·50	688	0·661	0·0109
		25·10	629	0·715	0·00996
		27·80	575	0·747	0·00912
No. 12 - Diameter: 1·00 m (Pl. XXXIII, p. 56)	30	10·84	369	0·488	0·01386
		15·45	353	0·608	0·01326
		20·70	318	0·701	0·01195
		24·80	258	0·728	0·00969
		29·80	170	0·635	0·00639
	35	11·10	390	0·446	0·07395
		16·18	580	0·574	0·01372
		21·80	521	0·670	0·01232
		26·50	457	0·713	0·01082
		29·95	393	0·716	0·0093
No. 13 Diameter 0·94 m (Pl. XXXIV, p. 57)	30	10·06	210	0·567	0·01047
		14·48	188	0·662	0·00988
		17·45	161	0·707	0·00803
		21·10	125	0·688	0·00623
		23·60	92	0·441	0·00459
	40	10·53	535	0·443	0·01125
		14·50	504	0·563	0·01061
		20·25	443	0·670	0·00932
		23·60	393	0·705	0·00827
		26·60	336	0·701	0·00707

Propellers Tested	n t/sec	Speed m/sec	Horse-power Pm kg m/sec	Effi-ciency ρ	$\frac{Pm}{n^3D^5}$
No. 14 Diameter: 0·94 m (Pl. XXXIV, p. 57)	30	10·02	190	0·569	0·00938
		14·55	170	0·698	0·0084
		18·25	130	0·751	0·00641
		20·70	100	0·692	0·00494
		24·20	70	0·282	0·00345
	40	10·55	559	0·414	0·01167
		14·60	534	0·533	0·01112
		19·70	468	0·652	0·00975
		25·50	360	0·723	0·0075
		29·00	270	0·632	0·00563
No. 15 Diameter: 0·655 m (Fig. 238, p. 57)	60	9·60	338	0·370	0·013
		14·05	338	0·492	0·013
		21·15	331	0·607	0·01272
		24·50	323	0·647	0·01242
		28·70	308	0·666	0·01185
No. 15 *bis* Diameter: 0·655 m (p. 58)	60	9·55	321	0·369	0·01234
		13·40	324	0·472	0·01246
		21·40	320	0·61	0·0123
		24·50	312	0·638	0·012
		28·70	288	0·639	0·01108
No. 16 A 4 pales Diameter: 0·655 m (Fig. 239, p. 58)	60	9·05	639	0·303	0·0246
		14·10	636	0·428	0·02445
		20·70	620	0·540	0·02385
		24·65	606	0·577	0·0233
		28·80	574	0·586	0·0221
No. 17 A 4 pales Diameter: 0·655 m (Fig. 239, p. 58)	60	10·40	650	0·333	0·025
		14·20	646	0·424	0·02485
		20·90	626	0·547	0·02407
		24·60	606	0·581	0·0233
		28·60	583	0·599	0·02242
No. 18 A 4 pales Diameter: 0·655 m (Fig. 239, p. 58)	60	10·80	647	0·350	0·0249
		14·50	650	0·442	0·025
		21·00	632	0·554	0·0243
		25·00	604	0·6	0·02325
		29·25	578	0·587	0·02225
No. 19 Diameter: 0·896 m (Pl. XXXV, p. 59)	30	15·3	278	0·620	0·01762
		18·00	272	0·687	0·01722
		21·6	244	0·762	0·01546
		24·70	215	0·811	0·01362
		29·40	142	0·806	0·00900
	35	14·90	483	0·544	0·0193
		19·40	480	0·643	0·0192
		23·35	441	0·718	0·0176
		25·40	414	0·743	0·01655
		29·30	360	0·789	0·0144
No. 20 Diameter: 0·95 m (Pl. XXXV, p. 59)	21	9·60	183	0·448	0·0253
		14·20	148	0·654	0·02058
		19·80	118	0·784	0·0164
		25·30	76	0·860	0·01057
		28·20	54	0·759	0·00751
No. 21 Diameter: 0·796 m (Pl. XXXVI, p. 60)	35	14·15	315	0·514	0·0237
		18·05	320	0·603	0·0240
		20·50	326	0·641	0·0245
		24·60	309	0·699	0·0232
		28·35	288	0·738	0·02165
	40	14·30	459	0·477	0·02323
		18·00	493	0·560	0·02495
		20·35	493	0·600	0·02495
		24·10	490	0·658	0·02480
		28·50	468	0·705	0·0237
No. 22 Diameter: 0·894 m (Pl. XXXVI, p. 60)	50	9·95	438	0·457	0·00641
		14·75	392	0·603	0·00574
		19·55	335	0·677	0·0049
		23·12	280	0·656	0·0041
		26·25	245	0·53	0·00359
No. 23 Diameter. 0·96 m (Pl. XXXVII, p. 61)	35	14·90	360	0·591	0·01048
		18·3	340	0·665	0·00989
		22·5	298	0·718	0·00867
		24 25	265	0·730	0·00771
		28·50	190	0·652	0·00559
	40	—	—	—	—
		14·90	523	0·564	0·01025
		17·90	515	0·629	0·0101
		20·22	504	0·665	0·00988
		22·60	471	0·694	0·00924
No. 24 Diameter 0·897 m (Pl. XXXVII, p. 61)	40	10·12	341	0·475	0·00921
		14·65	320	0·611	0·00865
		18·25	291	0·691	0·00786
		22·40	237	0·734	0·00641
		26·70	170	0·661	0·00459
	50	10·40	665	0·415	0·00914
		14·10	662	0·521	0·00909
		20·15	605	0·655	0·00831
		23·80	548	0·719	0·00753
		28·6	446	0·760	0·00604
No. 25 Diameter: 0·90 m (Pl. XXXVIII, p. 62)	40	—			
		16·92	468	0·574	0·01215
		21·68	451	0·645	0·01171
		25·40	404	0·683	0·0105
		29·10	338	0·684	0·00878
No. 26 Diameter: 0·80m (Pl. XXXVIII, p. 62)	50	10·30	350	0·457	0·00879
		15·55	320	0·599	0·00804
		20·40	275	0·677	0·00691
		24·00	242	0·672	0·00608
		28·70	180	0·535	0·00452

AERONAUTICAL PROPELLERS

By SPENCER HEATH*

THE aeronautical screw propeller or air screw, strangs as it may seem, was, in point of theory and conception at least, the predecessor and forerunner of the marine screw propeller. In the year 1768 there was published in France a treatise on the "Theorie de la Vis d'Archemedes." This very early publication, written by one A. J. Paucton, describes a machine equipped with two screws called by the author "Pterophores," description of which occupies a considerable portion of the book. It is noteworthy that to France we owe the first publication of screw propeller theory as well as the first public flight of an aeroplane propelled by that means.

In their basic priciple screws are the same for whatever purpose used. They differ only in their proportions, form and material. These differences are due to the different nature of materials through which the screws act. A machine screw acting through a previously prepared nut is a special case of a member progressing along an inclined plane, the movement of the member being along a helical curve instead of a straight line. A wood screw and a corkscrew, however, make their own "nut" through the cork or wood in which they act. These screws, in common with the machine screw, have an axial advance in one revolution substantially equal to the distance between turns of the "thread," known as the pitch of the screw. The air and marine screw are like the cork and wood screw in that they form their own "nut" through the air or water, but they differ markedly in that the fluid medium through which they pass has no great stability and yields to the screw in such manner that commonly the screw does not advance its full pitch in one revolution. This yielding of the fluid is entirely analogous to the yielding of the water to the bending of an oar or paddle. The resistance with which the fluid yields in the sternward direction creates a fulcrum for the oar and meas-

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ures the propulsive impulse of oar or screw. The magnitude of this impulse depends upon the density of the fluid medium and the sternward velocity with which it is caused to move.

The differences between air and marine screws may be said to be the reflex of the differences between air and water. Air is thinner, lighter, larger, swifter than water. Air screws are longer and thinner of blade, lighter in weight of material, larger in proportion to duty and swifter in velocity of rotation and of flight.

Almost all air screws are made of wood. In general appearance, except for width of blade, they resemble marine screws. The number of blades may be two, three or four. The widest part of the blade is usually at about six-tenths of its radius. The maximum width averages about one-tenth to one-fifteenth the diameter of the screw. The thickness of blade near the hub is very great, but diminishes rapidly to about half blade length and then gradually to the end. The side of the blade facing rearwardly is slightly concave in its wider and mid-radius portions and flat or slightly convex at its narrowed end and near the hub. The forward facing side of the blade is convex in all parts and the greatest thickness of any section is about one-third the distance from the entering to the trailing edge. Nearly all air screws have the general characteristics already mentioned. In blade outline, however, there is wide diversity. Some designers prefer to approximate a slender ellipse; others prefer the slender ellipse with squared ends on the blades; others approximate a semi-ellipse, the axis of the ellipse proceeding radially from the axis of rotation and forming the trailing edge of the blade. Among these various forms no special preference is known. Some of them are laid out with a view to placing the centers of gravity of all the blade sections in one radial line; some with the aim of having the center of pressure on each blade section lie in the same straight line.

In all the above forms of blade a common property obtains: The deflection of the blade under load is accompanied by more or less increase of angle in its most effective parts, thus augmenting the pitch. This gives the blade a sort of unstable pitch which may introduce heavy strains and resistances to the turning of the propeller at the moment when highest turning speed is required. In order that the pitch may remain unaffected by bending or deflection of the blades under load or increase of load it is necessary to dispose the centers of pressure of the sections farthest from the hub on a line curving somewhat rearwardly in the direction of the trailing edge. This practice is followed to a large extent by the company with which the writer is connected, who also specialize very much in variable-pitch propellers. These are designed by so far extending the rearward curvature of the blades that the appilcation of working blade pressure will institute a torsion action on the entire blade, causing its pitch to increase or diminish in response to variation in pressure. In this torsion design for variable pitch the portion of wood employed in the curved trailing edge of the blade is steamed and bent so that the grain of wood parallels the curved edge of blade. In this process a slight compression is given to the fibers which greatly increases the endurance of the thin-edge portions of the blade.

Nearly every kind of wood has been used in propellers. Walnut and mahognay have long been favorite in Europe. The writer's experience rules out all wood that was not quarter sawed, and points to American quartered white oak as the surpassing material from every standpoint, the particulars of which need not be detailed here.

It is almost needless to say that the wood for air screws is selected and treated with utmost care. The boards are sawn to one inch, rough-dressed to seven-eighths and finish-dressed to thirteen-sixteenths or three-quarters.

The screws are built up by five to ten laminations according to size. The laminations are laid out on the boards and sawed to outline, care being taken to avoid all defects in wood and to have the grain and density of wood as nearly similar as may be at opposite ends of the same piece. In the better and preferred practice, however, the laminations for each single blade are laid out separately and carefully weighed, matched and balanced against each other. They are then selected in pairs (or in trios for three-bladed screws) and their hub ends securely glued together in highly efficient joints of very large glue-contact area. Only by this method is it possible to make the blades of the same propeller uniform in respect to weight, grain, texture and yielding of the wood under stress.

When the separate laminations have been prepared and surfaced to required thickness they are slightly roughened by tooth planing, warmed over steam coils and assembled together with the best of hide-stock glue and firmly clamped. The entire gluing process is carried on in a room kept at 100 degrees F. After eighteen to twenty-four hours the clamps are removed and center hole in hub bored roughly to size. The propeller is now hung for about ten days to dry. It is then put through a machine which at one operation faces both sides of the hub and bores out the center hole to finish size. After being faced and bored the propeller is "outlined" in a machine that profiles the hub and edges of the blades all to exact size and shape by means of a rotary cutter following a form which has the precise outline of the blades.

From the outlining machine the propeller progresses to one of the duplicators. In this machine the work is clamped in definite relation to a rigid, fixed form having the same shape as the blades. On the carriage of the machine there is a roller which traverses the surface of the form and guides a high-speed cutter in a manner to remove nearly all surplus wood from the rough propeller. The carriage is self-feeding and self-reversing, and the bed and other parts of the machine, including the form, are made duplex in order to secure continuous operation of the cutter, the work being removed and renewed at each end of the machine in turn while the carriage is operating uninterruptedly at the other end.

After the duplicating process the propeller again dries for a few days, after which it is carefully surfaced and balanced by hand and then forwarded to the sanding machine. After sanding there is careful inspection in the white and careful examination of balance, pitch and tracking of blades, hub dimensions, etc. The inspection itself is an elaborate process requiring special appliances, etc., of various kinds.

From inspection the propeller passes to the finishing department. Here it is first treated with silex filler, then with primer, and lastly with various coats of high-test waterproof spar varnish. This is the usual finish. For certain United States Army work five applications of hot linseed oil and a final rubbing with prepared wax are required. During the entire varnishing process the propeller is kept carefully balanced on a steel mandrel resting on sensitive parallel ways. Without this very few propellers could pass final inspection.

On final inspection the utmost attention is given to every detail. Balance must be absolutely perfect in all positions; the blades must track within .03 inch; the pitch of the blades, checked at three points, must not vary from the standard by more than two per cent. nor from each other more than one per cent. These limits are only to allow for possible changes in the wood during the finishing process after inspection in the white.

A few words should be said as to the number of blades: For training work and all ordinary work, provided a sufficient diameter can be swung, two blades are usually preferred. For expert flying and for high-powered machines in which there is a restricted diameter of propeller in proportion to power applied, three and four blades are required. As to the relative merits of three and four blades there is no conclusive data. It is known, however, that in numerous instances the three-bladed screw, even though having less diameter, shows marked superiority over the two-bladed *in every particular*. The three-bladed propeller is also noted for its peculiar jointing and fitting of the ends of the laminations together where they form the hub. This hub is trebly laminated over its entire area with the material so disposed as to direction of grain, etc., that it makes without doubt the strongest hub that can be built in any propeller regardless of the number of blades. In repeated cases of wreck and accident all the blades of these propellers have been wholly demolished, leaving the hubs always intact.

After final inspection the propellers are usually packed in standardized pine or white cypress boxes with screwed-on covers and heavy battens and iron-bound ends. A center bolt clamps the propeller between battens in the top and bottom of the box, and felt-lined pillow blocks, formed to the shape of the screw, secure it firmly in place.

Probably no essential instrument in aeronautics has more nearly reached its ultimate development than has the screw. However, the elastic nature of the air and its wide divergence from water in its other qualities opened up possibilities of development that could not enter into the marine propeller problem. This article, devoted mainly to constructional features, cannot go into the various departures from marine propeller practice that have been indicated by theory and experiment and confirmed in practice. These relate to the particular forms of blade sections preferred by the air, the ratio of blade and disc aera, the relation between pitch and width in different parts of the same blade, and many other questions of great interest.

Occasionally the suggestion is made that the screw is not always to remain the chief propelling instrument for air craft of every sort, but that it will be finally displaced by some superior device. Many substitutes have been patented or proposed, varying in form from tiny jets of steam, gas or air to huge devices like amusement wheels with suspended cars, but none of them, not even the ornithopter or wing-flapping device, has become a recorded success. The very high efficiencies reported for air screws under certain conditions (somewhat more than eighty per cent.), even if only moderately improved by future developing or refinement, present a none too encouraging outlook for the more complex and pretentious affairs that are frequently proposed.



MILITARY AEROSTATICS



Missouri Aeronautical Society Training Men for U. S. Aviation Duty

St. Louis, Mo.—An Associated Press dispatch states every week in St. Louis an average of twenty-eight men qualify as balloon pilots, the first step in a long and tedious period of training to become balloon observers for the United States army.

The men are being trained for the Balloon division, aviation section of the signal corps, by the Missouri Aeronautical Society, of which Albert Bond Lambert is president.

To obtain a license from the Aero Club of America, a "rookie" must take seven flights, one all-night flight and a "solo" flight. A "solo" flight consists of laying out the balloon, inflating it, making a trip, deflating, packing and storing the balloon without assistance. The "solo" trip is what the students like best, for it is the most exciting and interesting of them all.

All the students are sent here from the Omaha training station, where they take the preliminary physical and technical examination. After making their qualifying flights here they are sent back to Omaha for intensive training.

Balloon Pilot Certificates

The following spherical balloon pilot certificates were granted during the week of September 10th, by the Aero Club of America:

No. 102 Richmond J. Harris.
No. 103 Elmer Dungan.
No. 104 Ashley C. McKinley.
No. 105 Chas. L. Hayward.
No. 106 S. T. Moore.
No. 107 Edward Glik.
No. 109 Thomas P. Breen.
No. 110 Louis C. Sanguinet, jr.
No. 111 Jas. A. McDevitt.
No. 112 James H. Zipp.
No. 113 Thomas D. Gordon.

The Kite Balloon in Warfare

THE kite balloon is another of the many implements of modern warfare which we owe to the far-seeing Hun, and it is only comparatively recently that it has come to assume its full role in our own operations.

If memory serves aright it was at Verdun that our French allies first made extensive use of this method of observation, an example which we followed on the Somme; with what results the Germans themselves have testified.

The first and chief duty of the kite balloon is the regulation of artillery fire, particularly in connection with heavy batteries. For this work it has advantages over the aeroplane because of the high speed at which the latter is bound to work, constantly wheeling and flying backwards and forwards in order to keep within reasonable distance of the object, with attendant drawbacks for the observer endeavoring to spot the fall of shot. The kite balloon observer, on the other hand, sits in a practically steady basket with far more of what may be called the comforts of home than are possible in an aeroplane. He has a map table on which he can plot the bearing and range of the objective, and is able to use binoculars of 12, or even greater, magnification, which he can keep steadily trained on the target. In addition to this he is in direct communication by telephone with a ground station—where more elaborate plotting can be carried out than in the basket—and with the battery itself. The enormous advantage of the latter point can be readily imagined. The battery hears instantly the effect of a round and can if there be any doubt obtain further details at once, instead of having to go through all the exasperating delays and repetitions inevitable in the staccato communication of wireless telegraphy.

The kite balloon carries two observers, both of whom can concentrate on the work in hand without being occupied with the control of their mount. Two operations can therefore be carried on by the same balloon. One of the observers will be engaged on spotting for the allotted battery, while the other will be keeping a general eye on the country within the sector under observation, watching for the flashes from the guns of hostile batteries, massing of troops for a counter-attack, movements of trains, etc. Should an important object—such as an ammunition convoy—suddenly present itself, the battery may be temporarily switched on to it without any long process of giving a fresh map square or compass bearing, but by the simple method of indicating the number of degrees right or left of the existing target. When such a "fleeting opportunity" target has been dealt with the prearranged shoot may be continued.

This is an instance of what can be done, but in practice it is probably better for one balloon to confine itself to working in conjunction with a battery in counter-battery work or demolition of a suspected observation post, while another balloon acts more or less as a free-lance and keeps its eyes open for chance targets which may present themselves.

(To be continued)



A class of balloon students at one of the training schools

FOREIGN NEWS

DENMARK

Copenhagen, Sept. 16.—A German military aviator, Verner Missen, is reported to have perished in an attempt to go from Hamburg to the German town of Warnemunde, on the Baltic.

Part of his wrecked machine was found on the eastern shore of the Danish island Langeland.

FRANCE

The Lafayette Escadrille, composed of American fighting aviators, was formally cited on September 10 for bringing down a total of twenty-eight enemy aeroplanes. The record was so unusual as to move French war officials to the highest admiration.

Paris, Sept. 10.—A French official statement says:

"September 8 and 9 five German machines were brought down in aerial engagements. In the last week Captain Guynemer brought up to fifty the number of German machines which he has destroyed.

"Sub-Lieutenant Nungesser gained his thirtieth victory, and Captain Beurteux his twentieth. Sub-Lieutenants Madon, Ortoly and Lufbery and Adjutants Fonck and Jailler each brought down his tenth adversary.

On September 12 French fliers raided Roulers, Courtemarck and Staden, in Belgium, and hostile establishments at Colmar, Conflans, Fermy and Sarreburg. During the day they bagged fourteen enemy aeroplanes, four being demolished and the ten others falling badly damaged within their own territory.

Sept. 15.—The Lafayette Escadrille is taking a very active part in the fighting on the Verdun front. This week has been particularly busy and air battles have been of daily occurrence. Sergeant Ray Bridgman and Sergeant Walter Lovell, who have been in the service four and five months respectively, have had three fights running, in which the former was touched by several bullets. Sergeant Kenneth Marr was in an exciting duel with a single adversary and disabled him, but is not sure he brought him down. Lovell has not been credited with his second German, whom he sent to earth last week, as confirmation was not possible.

Dudley Hill has been made an adjutant. Sergeant Stephen Bigelow has received the Croix de Guerre for his exploit in driving off six German fliers who attacked a French bombing squadron on August 20. He is now ill in a hospital. Corporal James N. Hall has recovered from his wounds and has returned to active duty with the Escadrille.

GERMANY

The following letter, just taken from a German prisoner, gives some idea of the panic created at Essen by Sergeant Gallois's exploit in bombing the famous Krupp works on the night of July 6:

"Essen, July 7.

"Last night we had the visit of an enemy air squadron. I was awakened by the anti-aircraft guns that began firing a hundred rounds in succession. The window panes trembled. The sirens of all the factories began to shriek and the bells sounded the alarm. It was terrible. Rockets were shot up on every hand. All of the street lights were extinguished. All of the factories were darkened and every one sought refuge in the caves and cellars.

"When calm was again restored every one went to bed, but immediately afterward other aeroplanes came and it all began over again.

"Bombs were also thrown on the Thyssen plant at Mulheim. The new Kruppstrass plant, the new munition factory, is destroyed from top to bottom (total kaput). I cannot give you yet the complete details. I will write you tomorrow.

"Placards have just been posted this instant announcing that the raids will be repeated this evening. Nobody at Essen will sleep tonight!

A War Office statement on September 10 says that 295 aeroplanes of the Allies were brought down during August, 126 ablaze within the German lines and 169 inside the lines of the enemy. Seven captive balloons of the Allies also are reported destroyed.

The War Office places the German loss for the month of August at four captive balloons, and says that sixty-four aeroplanes which went out to give battle to the enemy have not returned.

Dunkirk, the French Channel port near the Belgian frontier, was bombarded recently by German land and air forces. The *Petit Journal* publishes a letter from Dunkirk dated September 6, reporting a heavy bombardment by German aeroplanes and long range guns. Numerous aeroplanes dropped high explosive and incendiary bombs, causing casualties. French aeroplanes went up to attack the enemy, who was numerically superior, and succeeded in repelling him.

Lieut. Walter Hoehndorf has been killed accidentally on the western front, according to an announcement in German newspapers. Hoehndorf was reputed to be Germany's best aviator after Boelke and Immelmann, both of whom were killed on the western front.

GREAT BRITAIN

London, Sept. 12.—Further extensive bombing raids have been carried out by the British Naval Air Service on various objectives, chiefly in Belgium, in the course of which successful engagements were fought with hostile machines. The official announcement follows:

"In the last twenty-four hours many flight patrols have been carried out by the Naval Air Service. One of these patrols engaged two enemy spotting machines, one being shot down and the machine falling into the sea and the other landing almost intact in our lines. The pilot and observer of the latter machine were made prisoners. Two other enemy machines were attacked and driven down during the sweep by our machines. In conjunction with a bombing raid nine enemy machines were encountered, five of which are believed to have been driven down out of control.

"Bombing raids were made last night on the St. Denis-Western Airdrome, the Gontrode Airdrome, the Bruges Docks, the Throurrout Railway junction and on railway objectives near Ghent. Several tons of explosives were dropped.

"During yesterday forenoon a bombing raid was made on Sparappelhoek, the Thourout Airdome, and the Engel ammunition dump. At Sparappelhoek bombs were observed to explode among the hangars, causing much smoke, and at Thourout a direct hit was observed on a hangar. At the Engel ammunition dump a large fire was caused. The bombing formation was attacked by enemy machines, and one of the latter was shot down smoking and out of control. Many tons of explosives were dropped.

"From all these operations all the machines and pilots returned safely."

Sept. 15.—On Saturday the weather did not improve. A strong west wind still rendered difficult the return of our machines from bombing raids and fighting behind the enemy's lines. Artillery and photographic work continued, and three tons of bombs were dropped on two hostile airdromes east of Courtrai, and airdrome and ammunition dump northeast of Cambrai and hostile billets and hutments. Six German machines were brought down in the air fighting and two were brought down out of control. Four of our machines are missing.

ITALY

A report from Rome on September 15 says: "On the Carso the enemy's lines of communication were bombarded by our airmen with about three tons of bombs."

A semi-official wireless despatch from Rome says six enemy aeroplanes were brought down or compelled to land in engagements from September 6 to 14.

Captain Baracca won his nineteenth victory, bringing down an aeroplane behind Monte San Gabriele. Other Italian aviators won their eleventh, tenth and fourth victories.

Troops massed in the Ravnioa area, east of Monte San Gabriele, were bombarded on September 16 with about two and one-half tons of bombs by two Italian aerial squadrons.

Grado, Italy, Aug. 12.—Ever since June, 1915, Grado has been occupied by the Italian navy, and today all those characteristics which showed the little seaport to have belonged to Austria have disappeared.

As an aviation centre Grado offers indeed excellent possibilities. Seaplanes hover constantly over the little summer resort with its hundred hotels and boarding houses. Air combats have been frequent in the neighborhood. It gives the Italians an immense advantage in the struggle for control of the air. Venice is far enough removed from Triest, even from Pola, so that the defenses can be organized and warning given. But from Grado Triest can be reached in less than a quarter of an hour. Woe to Triest were it not an unredeemed Italian city. Otherwise, as reprisal for the wanton bombardments of Venice, it would, I believe, veritably have ceased to be. Triest lies in full sight of Grado and, with the afternoon sun of a clear day shining on its water front, seems but a long swim across the gulf.

Recently, however, our Italian allies decided that they oculd not permit their scruples about bombarding a friendly city to prevent them from taking revenge on the chief Austrian port for the brutal recklessness of Austrian airmen.

RUSSIA

In the Gulf of Riga on September 10 a Russian torpedo boat was twice attacked by sixteen enemy aeroplanes, which were met by the concentrated fire of the Russian torpedo boats. Forty bombs were dropped by the enemy, but without result.

On September 16 a Russian aeroplane dropped several bombs on Tveretch (south of Dvinsk). Successful hits were observed.

SWEDEN

The well-known Swedish airman, Captain Dahlbeck, has proposed a scheme to the Swedish government for the establishment of a seaplane service between Sweden and Finland. The Swedish General Staff is now considering the plan. The idea is that the seaplane shall start from Norrtelje, north of Stockholm, and finish at the mouth of the Gulf of Finland. The seaplanes will carry both passengers and mails. The journey from Stockholm to Finland via Haparanda now takes three days and three nights. By means of seaplanes it will be possible for the journey to be covered in a few hours. Captain Dahlbeck proposes to establish this new seaplane service as soon as possible.

A cable to the New York *Globe* and Chicago *Daily News* from Stockholm, says that the missing link in the aerial post plans of Europe is being forged this week by the Swedish Aeronautical Society, whose plans are going to take the air with a definite scheme for planning routes that are to bring the Scandinavian countries into connection with the rest of the continent aeroplanes. We heard of S. Montagu Belius's plans for three days' mail flights to India, with two stations in southern Russia and on the shore of the Persian gulf. Then came news of German plans for central European air mails, linking Hamburg, East Prussia, Galicia, Vienna, Sofia, and Constantinople. Next came the announcement of the actual initiation by the Italians of aerial mails.

These developments culminatively stirred Swedish aerial circles into activity. The Swedish plans fall into two categories. The first scheme is for a great triangular inland aerial mail service between Stockholm, Malmo and Goeteborg, to be put into operation soon after the conclusion of the war

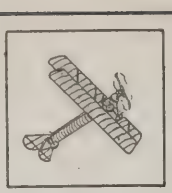
The surveyors are starting this week on preliminary flights over the route with a special view to finding suitable landing sites at Nykoping, Malmsatt, Nassjo, Alfastva, Hesselholm, Varberg, Goetborg, Falkoping, Halsberg, Katrineholm, and Stockholm. Then they will negotiate with the local authorities for the acquisition of the sites, after which hangars and repair shops will be erected at each sub-station.

In the second category fall the plans for Sweden's foreign communications by the air route. Captain Dahlbeck has already planned a north European air line which would pick up Norwegian mails brought to Stockholm, probably by Norse airmen, and convoy them with the Swedish mails for Finland and Russia.

Connections will also be made for carrying mails back and forth from northwestern Germany, Holland, Belgium, and France. From Stockholm the mails for Finland and Russia will be taken in an hour's flight to the Aland Islands, whence Russian airmen will fly east with them.

The Russian government has approved the scheme and has even offered to find the gasoline and lubricating oil if Sweden will initiate the service during the war, while oils are scarce in Scandinavia. Regarding the southward communication, Sweden anticipates the initiative of an air line from Malmo to Sassnits, where the Zeppelins will convoy them southward to the heart of Europe.

The time schedules are expected to be such that it will be possible to send a letter from Stockholm to Malmo in the morning and get a reply the same evening. No espcially high speed is contemplated. The Swedish Aeronatuical Society forecasts fixing a speed of 120 kilometres (seventy-two miles) an hour. No attempt will be made to supersede the land mails suddenly, but it is likely that letters will be carried by air routes for an extra fee of about fifty cents.



MODEL NEWS

Edited by G. A. Cavanagh



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Regarding Public Interest in Models

The following statement of Mr. Evans is worthy of consideration from not only English model clubs but also American clubs, a great deal has been accomplished with the "Flying stick" and not enough with the scale model. However, it is interesting that for the past year the scale model has been given more attention. Let us hope the interest will spread rapidly. Mr. W. E. Evans, the Hon. Sec. of the Paddington and District Aero Club, England, states as follows:

"The opening of a discusion through your columns on the above subject is both opportune and necessary for the future welfare of model aeroplane clubs. I quite agree with your correspondents, Mr. J. V. Winter and 'Scale Model,' that the general public have taken practically no interest in model aeroplaning, and no doubt the sole season is the lack of similarity between 'flying sticks' and full-sized aeroplanes. I have found that spectators of model flying are surprised that the machines are made to fly for such a long time or for such a long distance, but they are sadly disappointed with the appearance of the 'models.' In fact, the great majority are not 'models' but 'flying machines' which are practical impossibilities as full-sized aeroplanes.

"There will undoubtedly be a great boom in aeroplanes, both full-sized and model, after the war is over, for even America must admit they are having 'some ad.' It will therefore be their own fault if model aeroplane clubs do not turn it to their advantage.

"Now, why is it that most aeromodellists' flying machines are not prototypes of full-sized aeroplanes? I should say the onus lies chiefly with the Council of the Kite and Model Aeroplane Association, who organized competitions for 'flying sticks' instead of models. Members of the various model clubs naturally constructed and developed their flying machines to compete successfully for the prizes they offered. This continued too long with the result that full-sized machines have left the models far behind. A praiseworthy exception must be mentioned, namely, the Reigate and Redhill Model Aeroplane Club. It will be remembered that these enthusiasts exhibited a creditable lot of models at the last Aero Show at Olympia. They were mostly models with built up and covered in fuselages, and had the appearance of the real thing; but, alas, it was against them obtaining the necessary durations to win the prizes at the flying trials which followed. Result, no encouragement to build models.

"Duration has also been idolized by many of the leading aeromodellists, which is anything but conducive to scale model construction.

"The remedy for the present unsatisfactory state of affairs, I think, is for model clubs, and especially the Kite and Model Aeroplane Association (or the Aero Science Club of America), to whom they look for a lead, to organize competitions for models constructed as nearly as practicable to full-sized machines. Competition rules should be framed so as to ensure the machines being models, but not necessarily to scale. To those who are used to obtaining a minute duration or more with their flying stick, the result of their efforts might be rather disappointing at first, but I think it would be a good policy to forget those past durations for a while."

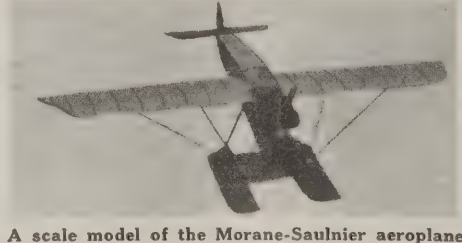
EDITOR'S NOTE—Suggestions from model builders concerning their views on scale models will help stimulate interest in the cause.

Model Work in Australia

From Melbourne Mr. H. Wallace-Crabbe writes as follows:

"Having seen in your columns that you will be pleased to accept any histories of model-making, &c., I thought I would jot down some of my experiences. I was induced to take up model aeroplanes in 1909 by a relative of mine, who sent me various postcards and photos of the early Blériot, Farman, and other machines, and I finished my first model about December 20. It was, if it could be called a machine, a sort of Blériot with zinc planes, a two-stick body, and a small clockwork motor, the propeller was made from two pieces of cane pinned to a tin centre. Of course, when I tried it, it was no good, and was immediately scrapped to make the next model, which turned out something like a Windham machine. For my first hundred machines I used the same clockwork motor, but, of course, it did not develop sufficient power to drive the propeller. Some of the models were very funny, as then I knew nothing of aeronautics, but at the time I am afraid I thought them 'just it.' However, many things were learnt about woods, soldering, etc., that I never knew of before; for instance, not having any tools, I decided to get them as necessity arose; I did not know how to tin an iron, or, as a matter of fact, I did not know what flux was for; however, *experientia docet.*

"Well, after many attempts with numerous models, I built a model out of thin cane and tissue paper, and put in a rubber motor, but the rubber kinked this frame all over the place. I strengthened the frame and tried again and again, until one day it struck me that the front planes must be made so that they could be moved. I tried this, and after a while, about March, 1911, began to get a little bit of success. So far all my machines had been tractors, but I then built a twin-propelled model which would not fly at all. I afterwards found it was because one propeller had a bigger pitch than the other, aond also that the propellers vibrated. Going back to tractors, I built several without success, and more than once decided to give it up, only to see one of my friend's models fly, and then I would build another. At the beginning of 1913, on trying wire planes such success was met with that by July of that year I had got a tractor to fly over 50 yards. I then turned to biplanes, and after building a good number made one in the early part of 1914 with a four-stick all-wire body, as shown in one of the sketches, and gears (tractor type), which got off the ground and flew about 30 yards, and afterwards it did about 100 yards. Two flying boats (both single tractors), were then constructed, but neither did anything but run along the water. A four-stick Morane followed, but without success, and so attention was turned to Taubes. My best flight to date was accomplished with one of them (three-stick body), shown in a sketch, viz., nearly 200 yards hand-launched. About three months ago I built a tractor biplane (four-stick covered), or, rather, a 'one and a half' plane, with a very large stagger on the planes and a very large tail."



A scale model of the Morane-Saulnier aeroplane



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

An Interesting Question

San Antonio, Texas.—Can a one-eyed cow-puncher aged 51, hope to become a successful aviator?

This is the question that Miss Marjorie Stinson, chief instructor at the Stinson School of Flying here has been asking herself ever since the receipt, a few days ago, of a unique communication from a resident of Pecos County. The letter, which is full of erasures and obscure chirography, follows:

Respected Lady:—Me an' Pete, who is my pardner and a most particular friend of mine, calculates we'll quit raisin' steers for a spell an' fight for Uncle Sam. That's what we figgers on. But them young army doctors over to El Paso figgers it plumb different. They figgers him an' me aint fit to fight no more aint fit to fight, an' him and me still driving nails with our Winchester same as we useter. Howsoever, they claim we're plumb over age, an' so we may be—I bein 51 an' Pete bein' 54. An' they claims I aint got but one eye, an' so I aint—the other havin' been formerly shot out by a greaser at Cow Creek, which don't effect my shootin' none at all. An' they claims Pete aint got none too many fingers on his left hand, an' so he aint—leastways not enough to mention. But him an' me plumb hates the Dutch, an' we figgers its our derned duty to find some way to beat them army doctors.

An' we figgers that them there airyator-fellers what we've be ben readin' about aint none too plentiful at the present writin', an' we figgers that if we learn to fly a airyplane right smooth an' smart-like, maybe them doggone doctors won't be so particular about fingers an' sech, which don't effect folks' fightin' qualities in no way whatsoever.

An' so if you'll send along a couple of contracts, me an' Pete reckons we'll sign up right off, an' sell the herd, an' come on up to San Antone; an' learn to be a couple of airyators.

An' I might say in closin' that besides shootin' rings around everybody in Pecos County, me an' Pete has had right smart experience with gasoline. We've been drivin' Ford cars for quite a spell, an' I reckon there aint no airyplane made what can get as plumb locoed as them things can when they wants to.

The foregoing was postmarked Fort Stockton, Texas, and signed, John McDermot.

During her career as an aviatrix Miss Stinson has taught many kinds and conditions of people to fly. She is at loss, however, whether or not to accept Mr. McDermot of Pecos County, and his friend Pete, as pupils.

The dog stood on the railroad track,
  A smile was on his visage;
He did not see the train coming
  Toot! Toot! Bologna sissage.

Extract from a letter of a girl to her friend—

"We have had two Zeppelins over here this week, one last night which mother saw going to church, and one on Tuesday. . . . . "

Evidently a "repentant murderer."

Fly over others as you would have them fly over you.

A rolling 'bus gathers much moss.

A Gnome by any other name would smell as—Gnome.

A switch off in time saves—nine days in the repair shop.

What to tell an aviator when he wants a whisky and soda—"Buy plain water."

There's many a slip 'twixt the straight and the *brevet*.

Charlie in his Nieuport new,
Found an air-hole and fell thru;
Number five cylinder then missed fire.
(He plays a harp in the heavenly choir.)

A gay young fellow named Kayler
Got a job as an aeroplane sailor
  But after a trip
  And a long spiral dip
Wished he'd stuck to his place as a tailor.

Farmer (angrily)—"Here! What are you doing in my apple tree?"

Sharp-Witted Small Boy (courteously)—"Excuse me, sir; I must apologize for my seeming intrusion, but the fact is, I fell out of a passing aeroplane."

"Yes, I'se registud all right, and I'se already concreted; what you gonna join, de infamy or de calvary?"

"No calvary for me. I's going' in dat infamy. When de Genrul sound de word 'Retreat,' dis nigger don' wan' to be bothered with no hoss."—*Christian Register.*

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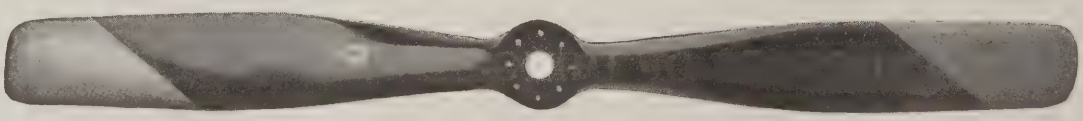
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Transatlantic Flight

(Editorial in N. Y. *Evening Sun*)

Such is the confidence that General Cadorna's sweeping offensive inspires that Americans are prone to accept the assurance given by Italian airmen at their reception by the Aero Club of America, that their new Caproni machine is preeminently qualified for transatlantic journeys. The suggestion furthermore has a distinctly utilitarian aspect, for it is not merely a proposal for an exhibition flight from the old world to the new. The commission wish to see the machines built in this country and flown to the theatre of war.

It may be that the Caproni warplane of some 2,000 horse power has signal advantages over the greatest machines yet built in Britain or America. Be that as it may, all signs portend a dawning era of transatlantic flight. From Newfoundland to the Azores is a feasible first leg, whence Portugal is readily attained. Of still more interest to the present generation would be a demonstration of wing power bringing all points of Europe's flatlands within scope of a fiery scourge.

If the Italian Government wishes to co-operate, the Administration would do well to incubate a brood of the Caproni war birds.

Recent Aeroplane Development

During the first two years of the war people interested in the development of aircraft for peaceful uses were disappointed by the absence of any progress toward a serviceable type. Aeroplanes grew smaller instead of larger. Load carrying capacity was wholly subordinated to speed in ascending and readiness in handling. The scout and the fighting plane, carrying only one man and a machine gun, were the machines most generally used, and every possible ingenuity was exercised to perfect their type and multiply their numbers. Even the earlier bombing expeditions, like those to Friedrichshafen and Essen, were undertaken by these light machines carrying a single man. Russia, it is true, had her huge Sikorsky machines, but they cut very little figure in actual service.

The Zeppelins, which just before the war seemed capable of use and development as passenger craft, sustained a fatal shock in actual service. Their inventor had always been indifferent to any possible commercial use they might serve. For him they were only great aerial engines of war wherewith to strafe England. But they proved cumbersome, costly and fragile. Instead of developing under war's tests and needs they deteriorated. The last one built was no better than the first to enter the war. Their factory has been closed and there is no reason to believe that the passenger service which was fairly launched before the war will ever be renewed.

In late months, however, there has been a tendency to increase the size and carrying capacity of military aeroplanes. It is evident that if these are ever to be of use in peaceful transportation there must be a material increase in size, in carrying capacity and in cruising radius. Nine out of ten of the present types are serviceable in war and sport, but for nothing else.

Great Britain has just sent to the United States plans for biplanes capable of carrying nineteen men, with 600 horse-power engines and a weight of guns and ammunition exceeding three tons. Aircraft of this character are already building in England and the factories of the United States are to supplement their efforts and to increase the fleet of heavy fighters.

The new Caproni machines which Italy is building for the arduous aerial campaign in the Dolomites and about Trieste will easily survive the war and become serviceable in peace. An airship that will carry twenty-five men, together with guns, bombs and ammunition, amounting in all to five tons; which is capable of a speed of 157 miles an hour and a flight of 1,000 miles without stop for fuel, and which, too, may be further increased in size and power, offers notable possibilities for service in times of peace.

Between New York and Washington, Buffalo and Boston and intervening cities regular scheduled flights of machines of this character could be held even hourly. Chicago, Cincinnati, St. Louis are all within their zone. The railroad time of passage would be cut in half, the railroad fares need not be exceeded and the increasing use of safety appliances and perfection of construction would enable them at least to maintain the railroad ratio of safety.

The new activity in the construction of huge aeroplanes not only offers promise of effective action in war but suggests that when peace comes man will make the air his highway on peaceful errands.

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(*Continued from page 63*)

and a crowned deck to let the water off easily. Both of these floats are for use in connection with tail floats as they are short and when hung to the plane so as to float in the position shown, they have almost no righting lever aft of the center of gravity.

Sketch No. 3 is practically No. 2 with the addition of a tail to take care of the longitudinal stability when at rest. Note that the bottom of the tail slants upward and rearward from the step. This, as previously explained, is so that the tail will lift clear of the water and allow the plane to balance about its step.

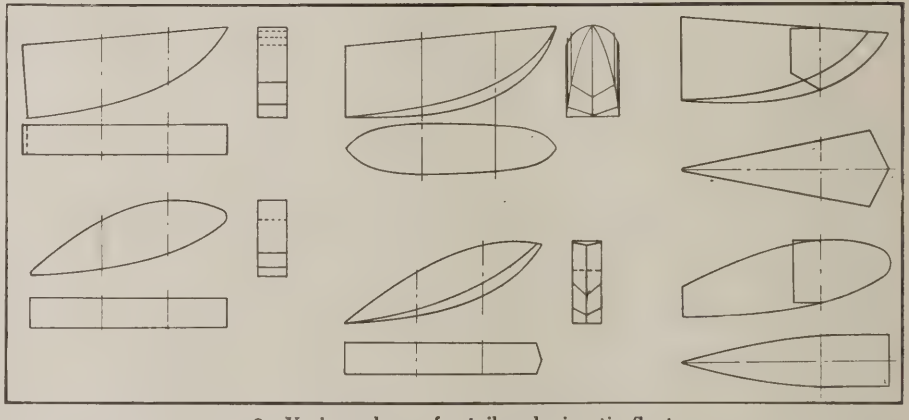
Sketch No. 4 shows an attempt to keep down spray by slanting the sides forward ("flaring" them as the naval architect would say). While quite widely used it is doubtful if the slight advantage gained is worth the considerable increase in cost.

Sketch No. 5 shows a British method of arriving at the same result. Note that they use a flat instead of a "V" bottom.

Sketch No. 6 shows a widely different type of float as developed by Lieutenant Holden R. Richardson, U.S.N. It represents the best American practice today. He has achieved both light weight and lessened skin friction for a given displacement by combining the top and sides in one semi-cylindrical surface. This as well as all the floats illustrated may be used either in one or two float systems.

Sketch No. 7 shows a typical flying boat hull for comparison.

Sketch No. 8 shows various wing and tail floats. The use of tail floats has been already explained. The wing floats are carried one under the end of each wing on flying boats or seaplanes, to throw the machine back to an even keel. In designing them due cognizance must be taken of the righting moment required so as to make them really work and yet not be larger than absolutely needed.



8—Various shapes for tail and wing-tip floats

"Air Navigation for Flight Officers"

Under this title Lieut.-Commander A. E. Dixie, R. N., has compiled a book, condensing, as the author points out in his preface, into a small compass all the subjects in navigation that officers in the Royal Naval Air Service are required to know. The utility of the book will not, we think, be confined to the Navy, but should be found of the greatest value to army students as well, since it deals in addition to explanations of the use of Admiralty charts, with the employment of Ordnance maps. Furthermore, civilian fliers, who are, of course, comparatively few in number at the present moment, but whose number will increase immensely after the war, will find this book an excellent guide, and so lucid in its explanations and concise in its general text is the book that it cannot fail to prove highly interesting and instructive to those who, although not flyers themselves, are interested in the subject of navigation in a general way.

One excellent feature of the book is that the author does not take anything for granted, but leads the student by easy stages from the simplest to the most complicated problems connected with aerial navigation. In the leading chapters the magnetic phenomena are simply and fully dealt with, the action and peculiarities of the artificial magnet being explained. The next step in the education of the aerial navigator takes the form of brief references to such magnetic phenomena as magnetic poles, magnetic equator, magnetic meridian, variation and deviation, &c. Then follows a thorough explanation of the fundamental principles of the compass, and the coefficients connected with deviation. The practical correction of a compass is very fully dealt with, as are also methods of "swinging" the compass. This brings the student to a stage where the machine is ready, as far as boxing the compass is concerned, for flying, and the problem of correcting courses is the next to be considered. An excellent chapter on meteorology, will prove both interesting and instructive, as will also the sections dealing with weather rules, astronomy, explanation of nautical tables, &c. The concluding chapters deal with chart and map work, and include, as has already been pointed out, reference to Admiralty charts as well as Ordnance maps. Some very informative subjects are thrown into an appendix, including tables of variation of wind velocity and height, "Air Navigation for Flight Officers," which is published by John Hogg, is a book that can be thoroughly recommended to all interested in this fascinating subject, and can be obtained from The Aeronautic Library, 280 Madison Avenue, New York.

AERIAL AGE WEEKLY

Vol. 6, No. 3 OCTOBER 1, 1917 10 CENTS A COPY



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A. S. Burleson, Postmaster-General

President Wilson Expresses Appreciation of Aero Club of America's Plan to Establish Woodrow Wilson Aerial Highway

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PRESIDENT WILSON EXPRESSES APPRECIATION OF AERO CLUB OF AMERICA'S PLAN TO ESTABLISH WOODROW WILSON AERIAL HIGHWAY

PRESIDENT WILSON in a letter to Congressman Murray Hulbert of New York, has approved the plan of the Aero Club of America to name the first National Airway the "WOODROW WILSON AERIAL HIGHWAY."

At the last meeting of the Board of Governors of the Aero Club a resolution was adopted to name the first national airway the "Woodrow Wilson Aerial Highway," in appreciation of President Wilson's support of the cause of aeronautics and to commemorate the signing of the six hundred and forty million dollar appropriation for aeronautics, which started the building of a substantial air service with which to strike Germany through the air and end for good the Prussian menace.

This resolution was telegraphed to Congressman Murray Hulbert with the following:

"The Woodrow Wilson Airway will be a straight line from New York to San Francisco, with connecting branches extending north and south of the main airway and reaching every important city from Maine to Puget Sound. The Board of Governors will appreciate it if you will kindly advise President Wilson of their resolution and ask his sanction. The need of aerial highways is becoming more evident every day, as manufacturers are planning to deliver the aeroplanes to the Army aviation fields by air, and the aero maps which the Aero Club of America and affiliated organizations had begun must be completed to facilitate air travel."

This telegram, which was signed by Mr. Alan R. Hawley, President of the Aero Club of America, was sent to President Wilson by Congressman Hulbert. President Wilson's answer is as follows:

"My dear Mr. Hulbert:

"Thank you warmly for having let me see the enclosed telegram. It heartens me mightily. It is very delightful to have such a feeling exist and to receive such evidences of support and approval.

"Cordially and sincerely yours,

"WOODROW WILSON."

The plans of making the map for the Woodrow Wilson Aerial Highway will be considered immediately by the Club's Committee on Aeronautic Maps and Landing Places, of which Rear Admiral Peary is Chairman, and Henry Woodhouse, Vice-Chairman. The members of this Committee, which is made up of prominent men, is as follows: Rear Admiral Robert E. Peary, Chairman; Henry Woodhouse, Vice-Chairman; Bion J. Arnold, Vincent Astor, A. G. Batchelder, George F. Baker, Jr., Captain Robert A. Bartlett, Bernard H. Baruch, August Belmont, James Gordon Bennett, Cortlandt F. Bishop, Captain Mark L. Bristol, U. S. N.; Starling Burgess, Godfrey L. Cabot, President Aero Club of New England; President Manuel Estrada Cabrera of Guatemala; Major Joseph E. Carberry, U. S. A.; Major C. C. Culver, U. S. A.; Newcomb Carlton; Lieut. Col. Charles De F. Chandler, U. S. A.; Captain W. I. Chambers, U. S. N.; J. Parke Canning, Roy D. Chapin, Alexander Smith Cochran, Robert J. Collier, Howard E. Coffin, Chairman Aircraft Production Board; Roy U. Conger, Glenn H. Curtiss, Commander Cleveland Davis, U. S. N.; Lieut. F. Trubee Davison, N. R. F. C.; Lieut. Col. E. A. Deeds, S. O. R. C.; Charles de San Marsano, Charles Dickinson, President Aero Club of Illinois; F. G. Diffin, W. Earl Dodge, Brig. General Robert K. Evans, U. S. A.; Rear Admiral Bradley A. Fiske, U. S. N.; Elbert H. Gary, John Hays Hammond, Jr.; W. Averill Harriman, Alan R. Hawley, William Hawley, Henry B. Joy, Frank S. Lahm, Captain A. B. Lambert, A. S. R. C.; Henry Lockhart, Jr.; Lieut. Robert A. Lovett, R. N. F. C.; Harold F. McCormick, Captain J. C. McCoy, Emerson McMillan, Eugene Meyers, Jr.; Captain James E. Miller, S. O. R. C.; Lieut. Commander Henry C. Mustin, U. S. N.; George M. Myers, President Aero Club of Kansas City; J. D. Park, George W. Perkins, Prof. Charles L. Poor, Augustus Post, Ralph Pulitzer, Col. Samuel Reber, U. S. A.; Ogden Mills Reid, Thomas F. Ryan, Alberto Santos Dumont, Frank A. Seiberling, Hon. William G. Sharp, Edwin C. Shaw, Lawrence B. Sperry, Brig. General George O. Squier, Chief Signal Officer, U. S. A.; James S. Stephens; Lieut. Commander J. H. Towers, U. S. N.; K. M. Turner, George W. Turney, Col. Cornelius Vanderbilt, W. K. Vanderbilt, L. A. Vilas, Rodman Wanamaker, Monroe Wheeler, Schuyler Skaats Wheeler, Harry Payne Whitney, G. Douglas Wardrop, Hugh L. Willoughby, Henry A. Wise Wood, Orville Wright, William Wallace Young, A. Francis Zahm.

The cooperation of the Council of National Defense, Army, Navy, Post Office, Coast and Geodetic Survey, the Manufacturers' Aircraft Association, the Aerial League of America, the National Geographical Association, the American Geographical Society, the Chambers of Commerce of the United States, and other government and commercial and scientific bodies will be invited to carry out this plan as soon as possible.

International Committee on Civil Aeronautics Appointed

STEPS are being taken by the Aero Club of America to form an International Commission on Civil Aeronautics, which is to study the possible application of aircraft for commercial purposes, and outline plans for the employment of the thousands of military aeroplanes and aviators after the war.

The Aero Club decided to organize this commission four months ago, when it became apparent that Congress would allow the large appropriations necessary to get the thousands of aeroplanes and aviators needed to strike Germany through the air.

It was realized that the country would be more enthusiastic in its support of the aircraft building program if it was known that these aeroplanes and aviators could be utilized for commercial purposes after the war. Also that manufacturers would be more apt to concentrate efforts in bettering aircraft, increasing the production, and employing machinery to cut down the cost of production, if they could see in the field a possibility for a permanent demand for aircraft.

At the time the Club had learned that other countries were organizing such Commissions.

In France the Commission on Civil Aeronautics was created January 6, 1917; in England, the Civil Aerial Transport Commission was created on May 23, 1917.

M. D'Aubigny, member of the French Chamber of Deputies, is the Chairman of the French Commission, and Lord Northcliffe is the Chairman of the British Commission.

To find out what was being done abroad in this line, the Aero Club of America sent Messrs. Evert Jansen Wendell and August Post to Europe. Unfortunately, Mr. Wendell fell ill soon after his arrival in France, and died August 27. A special committee consisting of members of the Aero Club of America, who are residing in France, has been established in Paris, to advise on developments that take place there.

A report has been received by the Aero Club of America from Mr. Post, who is in Paris, giving an outline of the French Government's plan to employ aeroplanes for carrying mail. There has also been gathered information regarding

the plans of the British, Italian, and German Governments to employ aircraft for commercial purposes. Among the reports collected by the Aero Club of America there is one prepared by Lieut. Col. Marvin O'Gorman, late superintendent of the Royal Aircraft Factory, in which are found the provisions for the use of aircraft for the following purposes:

(a) Transit of goods.
(b) Transit of letters.
(c) Transit of persons.
(d) Labor of transit service.
(e) Finance of Transaerial Companies.
(f) Government subvention of aerial transport.
(g) Private, sporting and domestic use.
(h) Scientific use, surveys, etc.

Having secured sufficient information regarding what other countries are doing in this respect, the Aero Club of America will now organize an International Commission, which will include in its membership the leading aeronautic authorities, scientists and delegates, scientific, official, commercial and educational institutions of different countries.

Ths Commission will also study the problems that will arise through the general employment of aircraft and try to evolve a working basis which will suggest practical laws to govern aerial navitation, international and national.

"The work of this Commission is very important," said Mr. Alan R. Hawley, President of the Aero Club of America, "Aeronautics is to be the most important factor in the reconstruction that will follow this war, just as it is the most important factor in the present war, and will decide the war in the air.

"The size of aeroplanes has increased to the point where we are now looking forward to flying across the Atlantic as a means of delivering the aeroplanes needed for striking Germany through the air, which cannot be delivered otherwise, on account of the shortage of tonnage. It has already been found that these large aeroplanes could make it possible to carry express and mail matter almost as cheaply as it is being carried by the usual means of transportation.

"The plans outlined by British, French and Italian authorities show conclusively that aerial transportation is to be a fact in the very near future. Italy has already a permanent aerial mail line between Turin and Rome, which cuts down the time of delivering the main at those two cities by between 20 and 24 hours."

"The Committee on Aeronautic Maps and Landing Places of the Aero Club of America, of which Admiral Peary is Chairman, and Henry Woodhouse is Vice-Chairman, has already made very complete plans for aeronautic maps and for establishing a chain of landing places across the continent. This Committee and the Aerial League of America and the National Aerial Coast Patrol Commission, and the Aviation Committee of the National Special Aid Society are co-operating closely in carrying out the plans of the Aero Club of America."

Look to United States for Aeroplanes to Win

IN an interview with the New York *World,* Lord Montagu of Beaulieu, made the following declaration:

"It will be only by means of an overwhelming air force that victory can and will be won. It is only natural that the American people with their alertness and intelligence should have grasped the essential truth at the outset that this war will develop more and more from being a land war and sea war to being an air war. That is where the United States can help quickly and efficiently."

Commenting on the great aerial activity which is now marking the progress of the battles on the western front Lord Montagu said:

"Man power is dwindling at different rates on all fronts except the Russian front, where it is temporarily disorganized, and it is inevitable, therefore, that Great Britain, France, Italy, Austria and Germany have for some time been turning to machine power and air power to make good the diminution of human material. For the past two years we have seen examples of this tendency in the extended use of machine guns and artillery, and a still more notable instance now is the daily increase in the intensity of the air warfare especially on the Flanders front.

"Two years ago air warfare rarely was mentioned in the official communiques. A year ago there were accounts every two or three days of deeds of our airmen, while today there hardly is an official communique from the British or French front which does not recount the varying fortunes of the air forces of the Allies. The truth is that the infantry is becoming, perforce, more or less stagnant. Cavalry cannot be used owing to various reasons, while the advance of guns, heavy and light, is dependent upon the advance of armies and the absence or presence of mud.

"All real activity therefore is in the air, in which it is impossible to construct trenches of concrete posts and in which only the worst weather stops operations. Artillery, however, is powerless even with clear skies at the heights at which most recent aeroplanes fly. We see, therefore, the greatest ingenuity and energy being displayed by all armies in an attempt to obtain air supremacy—that is, the power of keeping the enemy's aeroplanes from seeing what you are doing while you can see everything the enemy is doing.

If this can be achieved, combined with continual bombing raids of destructive character upon lines of communication and troops centres, the side which obtains and keeps for a period this advantage is on the high road to victory, present and future."

U. S. Plans Mail Service by Air

AS the result of a conference between Postmaster General Burleson and Secretary of War Baker, and with the approval of the President, Congress is asked to authorize the Secretary of War to turn over to the Post Office Department all military aeroplanes and motor vehicles not serviceable for military purposes, or which after the war may be dispensed with for military service.

As soon as authority of Congress is secured and any aeroplanes are turned over to the Post Office Department, aeroplane mail routes will be established in the country, as they now are in Italy and France.

To Authorize Motor Delivery

Having the approval of the President, the following has been adopted by the House Post Office Committee as an amendment to the Senate bill, authorizing experiments in motor truck delivery by the Post Office Department.

"Provided, That the Secretary of War may, in his discretion, deliver and turn over to the Postmaster General, from time to time, and without charge therefor, for the use in the Postal Service, such aeroplanes and automobiles, or parts thereof, as may prove to be, or as shall become, unsuitable for the purposes of the War Department, and the Postmaster General is hereby authorized to use the same, in his discretion, in the transportation of the mails and to pay the necessary expenses thereof out of the appropriation for inland transportation by steamboat or other power by aeroplanes from the appropriation for inland transportation by star routes."

The bill as amended was favorably reported to the House and is expected to be adopted speedily.

Will Use Aeroplanes

By the provisions of this bill aeroplanes which have become obsolete for military purposes, or which for any reason are not available for military use, but which have carrying capacity and speed, will be placed at the service of the Post Office Department for mail delivery.

Italy and France both make use of aeroplanes not longer suitable for military use for the purpose of delivering mail.

Italy has an aerial mail route from her coast to Sardinia, and is able to deliver 500 pounds of mail in two hours. France has a similar aerial route between her coast and Corsica.

The motor trucks procured from the War Department at this time or on the close of the war will be available for the parcel-post truck service.

The bill authorizes the Postmaster General to conduct experiments in the operation of motor vehicle truck routes in the vicinity of such cities in the United States as he may select, and under such rules and regulations as he may prescribe, and the cost of such experiments may be paid by the Postmaster General out of any of the unexpended appropriations for the Postal Service, not to exceed $300,000.



THE NEWS OF THE WEEK



Caleb Bragg Sets New Altitude Record Here

Caleb S. Bragg excelled his own American altitude record by flying to a height of 21,500 feet in a Wright-Martin aeroplane in an unofficial test at the Mineola aviation field, and his barograph was sent to the Contest Board of the Aero Club of America, with a request that the flight be admitted to the records as the new American altitude. Henry Woodhouse, a member of the Board of Governors of the Aero Club, and chairman of the Contest Board, said that the board had already given to Bragg the American record a few days ago for attaining the height of about 21,000 feet.

Bragg, who was famous as an automobile racer after his graduation from Yale in 1908, turned to aviation a few months ago, and for several weeks has been experimenting with his new aeroplane at the Mineola field, although he has had no connection with the army training camp there. In several flights he has reached a height of more than 17,000 feet.

It was an ideal day for an altitude flight, and Bragg was able to send his machine up in steady spirals until his barograph marked a height of 21,500 feet, or about 3,500 feet above height attained by other American aviators in test flights. He was about an hour and a half in going up. When he had reached an altitude of 21,500 Bragg found he would be unable to go higher because of the atmospheric conditions, and he began his descent, reaching the field again in about thirty-five minutes. There was great applause among the army aviators and students when the barograph record was read.

Changes Seat in 'Plane Thousand Feet in Air

Rantoul, Ill.—Major Maxwell Kirby, the new head of the Chanute aviation field, performed an astounding feat September 23, when he changed seats in an aeroplane at an elevation of more than a thousand feet. It was the major's initial ride at the field and he went up alone, making the ascent in the rear seat and using a stick control.

He did not fancy the stick control and climbed to the front seat to get the wheel. While he was making the transfer the 'plane was speeding through space at the rate of a mile a minute. He returned to the ground in the front seat of the 'plane, to the astonishment of the flying inspectors and students at the field.

Chanute Field officers state that this is the first time they ever heard of this feat being accomplished in America.

Hartzell Controls Excelsior Propeller

The Excelsior Propeller Co., of St. Louis, has been reorganized, enlarged and relocated in Piqua, Ohio, as the Hartzell Walnut Propeller Co., with M. J. Stone in charge of the making end of the business.

The three story brick factory with fifty thousand square feet of floor space, the latest improved propeller turning lathes, large supplies of dry walnut, with ample resources will enable the company to make prompt deliveries.

The company is building all propellers of American walnut instead of ash and giving great care to the details of construction, design and finish.

Louis Gertson Makes 247 Loops

Louis Gertson made 247 loops at the Michigan State Fair. These were made in six consecutive days and nights. Gertson made forty-one loops in one of his night flights, with his machine illuminated with fire-works.

Willis a Prisoner in Germany

Paris, Sept. 18.—An unofficial report received from the French front indicates that Harold Willis of Boston, the American aviator who disappeared after an aerial battle on August 19th in the Verdun sector, is a prisoner back of the German lines.

This information comes from German sources. At the time Willis disappeared all efforts to ascertain his fate were unsuccessful and notes dropped behind the German lines asking about him were unanswered.

New Gravitation Theory Soon to be Announced

A new theory as to gravitation will be announced before the St. Louis Academy of Science by Prof. Francis Nipper, retired head of the Department of Physics of Washington University.

In a written statement Prof. Nipper said: "'It will be shown that gravitation attraction between masses of matter not only has been diminished into zero, but has been converted into a repulsion, which is more than twice as great as normal attraction."

Professor Nipper made his experiments with bodies suspended horizontally toward each other. By introducing the electricity into the atmosphere he converted normal attractions into repulsion. "If electricity can alter the gravitation attraction of the bodies used in my experiment," he said, "the same force can alter the earth's attraction. If the negative electricity could be drawn from the earth's surface, gravitational attraction suddenly would cease and the coherence of the earth's surface would be disastrously affected."

Huge Italian Aeroplanes Thrill Washington

Daring Italian military aviators, in two battleplanes of great speed, and a giant bombing aeroplane carrying ten passengers, on September 22nd gave Washington a marvelous example of what the American Aviation Corps must do in order to strike Prussia through the air.

All three aeroplanes flew without accident from Langley Field, near Newport News, Va., to Washington, in less than two hours. The distance was approximately one hundred and twenty miles, and the average height was 7,000 feet.

In the great Caproni bombing machine, which has a wing spread of eighty-five feet, were several government officials, who enjoyed the trip immensely, feeling no inconvenience whatsoever. After arriving here, two of the aeroplanes thrilled thousands of spectators with feats of the air.

The exhibition ended with the flight of the great Caproni machine over the city with ten persons and the "bombing" of the White House by one of the smaller machines with bouquets of flowers. One of the battleplanes left for Newport News at four o'clock in the afternoon. The other battleplane, because of slight engine trouble, was forced to land on the Virginia side of the Potomac after it had reached and circled over the polo field in the Potomac Park, which was the official landing place. The Caproni bombing aeroplane was to have started back late in the afternoon to Langley Field, but a slight accident to one of the wheels delayed its leaving.

Many members of the House and Senate were present, and they were impressed with the efficiency of the Italian machines and the skill of their pilots.

Lieutenant Emilio Resnati, one of Italy's most famous aviators, piloted the Caproni machine. It carried Dr. S. W. Stratton, director of the United States Bureau of Standards; W. F. Durand, chairman of the National Advisory Committee on Aeronautics; W. B. Stout, member of the International Aircraft and Centralization Board, and formerly chief engineer of the Packard Motor Company; S. J. Kubel, map expert of the United States Geological Survey; Captain Tappi, of the Italian army, and four Italian mechanics.

All three of the machines are of Italian construction, and were piloted by Italian officers. One of the smaller battleplanes was piloted by Lieutenant Ballerini, with Lieutenant Franklin K. Lane, Jr., U. S. R., son of the Secretary of the Interior, as observer. The other battle-



The "Bloomer" Girls at the B. F. Goodrich Factory who are doing their bit by helping build Uncle Sam's air fleet.



The Ordnance Engineering Co.'s primary training tractor with side-by-side seating

plane was piloted by Lieutenant Balloli, with Lieutenant Abbetti as observer. Lieutenant Lane made an exhibition flight with a civilian passenger during the afternoon, and was at the wheel when his machine started back for Newport News.

Speaking of the flight, a few minutes after he climbed out of the Caproni car, Mr. Durand said: "Our experience afforded a wonderful demonstration of the degree to which the science of aviation has been perfected in Europe. It shows Americans what we have to learn. I feel certain that we can equal these Italian cars and that our young men will make as good fliers as these efficient Italians, but it will mean hard and careful work and many sacrifices."

The course took the aviators over the York, the Rappahannock, and the Potomac Rivers. They crossed the Potomac about fifty miles from its mouth, and again reached it about fifteen miles south of Washington and followed its course from that point on to their destination.

The first machine to leave Langley Field was Lieutenant Reznati's Caproni aeroplane. When it reached the Potomac it was overtaken by the Sia plane, which had left the Langley Field fifteen minutes later. The pilot of the Sia aeroplane caught sight of the big bombing aeroplane and shot under it at about one hundred miles an hour. The larger aeroplane was at the time making only about seventy miles. The Sia machine then passed upward into a cloud bank and continued on its way to Washington at a height of about eight thousand feet.

The pilot and passengers of the Caproni plane said when they reached Washington that they had not seen anything of the Sia, and, therefore, were not aware that it had arrived ahead of them.

After a short rest, both the Caproni and the Pomilio machines again ascended and did some spectacular flying. In the Pomilio was Lieutenant Lane. It ascended probably 7,000 feet and then dropped headforemost toward the earth, executing at the same time the famous spiral.

For a moment most of the spectators thought an accident had occurred, but when close to the earth the machine gracefully righted itself and started upward again.

Disappointment at Plattsburg

Plattsburg, N. Y.—There was great disappointment among nearly one hundred and fifty members of the training camp when it became known that word had been received from Washington that no members of the camp would be selected as student officers for the aviation section of the service. During the latter part of last week Colonel Wolfe wired Secretary of War Baker that there were 147 members of the camp who had expressed a preference for the aviation section and that these men had taken and passed the required physical examination for that branch.

Sweetzer to Write Aviation History

Another war historian has been appointed in the person of Capt. Arthur Sweetzer, Aviation Section, S. O. R. C., who has been detailed to duty in the office of the Chief Signal Officer with the definite assignment of writing the history of the activities of the Signal Corps. Captain Sweetzer was a representative of the Associated Press in the War Department until commissioned. As recently noted in these columns, Col. Champe C. McCulloch, Jr., M. C., U. S. A., and Major Fielding H. Garrison, M.R.C., are engaged in a surgical and medical history of the war.

Committee on Automotive Products Reorganized

The Council of National Defense has announced the reorganization under the War Industries Board of the Automotive Products Committee, which will have advisory supervision on all matters involving the use of internal-combustion engines, including the production of motor cars, trucks, and ambulances, tractors, motor boats, and aeroplane engines. The committee will serve under the administration of Robert S. Brookings, member of the War Industries Board in charge of finished products.

The membership of the committee as reorganized is as follows: Chairman, H. L. Horning, tractors and trucks; C. W. Stiger, representing the Motor and Accessory Association; Col. Chauncey M. Baker, of the Quartermaster's Corps; Coker F. Clarkson, representing the Society of Automotive Engineers; Frank W. Russell, representing the Aircraft Manufacturers' Association; T. W. Henderson, representing the Motor Cycle Association; Henry R. Sutphen, representing the Motor Boat Association; Hugh Frayne, member of the War Industries Board, representing labor.

A special auxiliary committee has been appointed to work on the military-truck program in co-operation with the Quartermaster's Corps. Subcommittees will also be appointed on priority, gasoline, and military motor cycles.



Lieut. Bert Hall, of the Lafayette Escadrille, who is now in America. The machine is a Nieuport scout

U. S. Flier Brings Down His Second Foe Airman

Paris.—Pilot Walter S. Rheno, of Boston, a member of the Lafayette Flying Squadron, has been granted a second palm to his war cross for bringing down a German airplane in an engagement on September 8, says the Paris edition of the New York "Herald."

This is the second German machine Rheno has shot down singlehanded.

Ascends 17,000 Feet With Twelve Passengers

Norfolk, Va.—In a Caproni aeroplane, Captain Emilio Reznati, the most daring of all the seven Italian aviators now in America, took twelve passengers 17,000 feet in the air.

Captain Reznati spent fifty-six minutes in the air, and during that time flew eighty-two miles. He said he could have done much better but for the fact that he was trying more for altitude than for speed.

The flight broke the world's record for altitude by machines carrying more than five passengers. The car used was the smaller of the passenger-carrying Caproni machines and was loaded to capacity.

Lafayette Flier Must Serve in Draft

The famous Lafayette Squadron of airmen in France's service may be partly disrupted by the government of this country, which has supplied its members. No ruling concerning drafted men, who may be flying with the unit in France, figures in the draft regulations.

The District Appeal Board in this city, at its session yesterday, denied the appeal of Herbert Dix Smith, now a member of the squadron, and certified him for service with the new National Army. The appeal was presented by Francis N. Smith, of 229 West Seventy-eighth Street, brother of the aviator, following the decision of Local Board 125.

J. F. McElhone, American representative of the Lafayette Escadrille, testified in an affidavit that Smith was at present a member of the unit, but the board was powerless to act. Unless the government officials grant Smith a release he will have to return to this country and report at a cantonment camp.

Accident at Belleville

Belleville, Ill.—Sergeant A. L. Alexander of New York, chief of squadron of the mechanical division of the United States flying corps at Scott Field, near here, was instantly killed September 18th when he attempted to inspect the running gear of an aeroplane that had alighted and was still in motion. A propeller blade broke his neck and fractured his skull.

Two Canadian Aviators Killed in Air Collision

Camp Borden, Ont.—Second Lieut. Williams and Cadet Ludford were killed September 18th when their aeroplane was struck by another machine which was trying to pass behind their craft.

The accident occurred near Pine River and was witnessed by virtually all the men taking part in a practice march, the line of which the aeroplanes were following.

France Honors American Hero's Memory with Croix de Guerre

The Croix de Guerre, the citation and a copy of the eulogy delivered at the funeral of Sergeant Lief Norman Barclay, who, as a member of the Lafayette Escadrille gave his for France, have been received by his father, Dr. H. V. Barclay, of No. 655 Madison avenue. These were sent by Dr. Gros, of the Lafayette Escadrille. Barclay was killed June 1st in an encounter with Prussian aeroplanes over the battle front in France.

That Sergeant Barclay was not only held in high esteem by his comrades and superiors but had distinguished himself repeatedly as a courageous soldier is shown by these papers sent by France as a last word of gratitude to his relatives here. The address at the funeral was delivered by Captain Echard, Commander of Squadron 82, of which Sergeant Barclay was a member, and is as follows:

"Sergeant Barclay, to whom we must, with great sorrow, pay final honors, was one of those Americans who came in such great number to fight for us during the first days of the war. Coming to France among the first, for two years he worked unceasingly among our wounded. Cited many times by his superiors for his superb attitude under fire, he still thought he wasn't doing enough for our country.

"Accordingly he joined the Foreign Legion and, turning to aviation, rapidly became an excellent pilot. When he came to our squadron he won the admiration of us all by his modesty, his bearing, his absolute disregard for danger and of his lofty sentiments.

(*Continued on page 105—Third Column*)

THE PRESENT PRACTICE OF ACCEPTING AND TRAINING AVIATORS

Qualifications of Candidates

Candidates for commissions as flying officers in the Aviation Section must be at least nineteen years old and preferably not over thirty, although in exceptional cases older men of pronounced athletic attainments who have spent most of their lives out doors, in the saddle, ranching, playing polo, mountain-climbing or in actual flying, may be accepted if they can satisfy the Examining Board of their physicial fitness.

Candidates should be men of the highest character, well educated and of good physique. They may be light in weight and youthful in appearance but applicants will not be recommended who are not in every way qualified and fitted to become officers of the United States Army.

It must be remembered that the flying officer is not an "aerial chauffeur" or "exhibition flyer." He has been more correctly defined as "a twentieth century cavalry officer mounted of Pegasus." It is obvious that candidates must be mentally alert, physically perfect, and have well disciplined minds and bodies.

Status of Candidates

All candidates are enlisted in the Signal Corps or the Signal Enlisted Reserve Corps. This will actually hold them for the period of training which covers the course at the School of Military Aeronautics (ground schools) and at the Aviation of Flying Schools up to the time when having passed the tests for a Reserve Military Aviator or Junior Military Aviator as required by the Chief Signal Officer, they are commissioned. If they fail they will be discharged from the Signal Corps and revert to their formal status. Failure to qualify for a commission will not exempt from the draft law.

During his entire course of training the candidate for a flying commission has the rank of Private First Class, but he may at the option of his commanding officer receive temporary detail in such other grades as may be required by the organization of the Schools of Military Aeronautics and the Aviation Schools. These temporary grades, however, do not carry extra pay, warrants or commissions, and are only for the instruction of those detailed.

The candidate may be discharged at any time during his course of training by reason of failure to pass tests of examinations, by giving evidence to his commanding officer that he is unfitted either mentally, morally or physically for the duties of a flying officer, or for any other reason which shall in the opinion of the examining board, and subject to such approval as necessary, render his services no longer desired. The actual mental and physical requirements for a flying officer are so great, his ability to do several things at once and do them all and accurately are so essential, that discharge is not necessarily any reflection on the man's character, loyalty or devotion to duty.

Pay and Allowances of Candidates

From the time when the candidate is assigned to duty at the ground school until he is discharged or has passed all tests and is recommended for his commission he receives the pay and allowances prescribed for candidates under the provision of Special Regulations 49, War Department, 1917, expect that under present instructions from the Secretary of War the allowance for rations is sixty cents daily instead of seventy-five. The pay, however, remains at $100 per month. This rate includes his regular pay as Private, First Class, and is not in addition to it.

Objects of the Schools of Military Aeronautics

The objects of the Schools of Military Aeronautics are,

1. To teach candidates their military duties and develop soldierly qualities.
2. To eliminate those who are mentally or morally unfitted to become flying officers.
3. To give the necessary preliminary training in the use of the machine gun, wireless telegraphy, the operation and care of aeronautical motors, assembling and care of airplanes, principles of aerial tactics, cooperation with other branches of the service and the fundamental principles of cross-country and general flying.

Organization of Schools of Military Aeronautics (Ground Schools)

The organization of a School of Military Aeronautics includes a Commandant, who is an Army officer selected by the Chief Signal Officer to be the commanding officer of the Post at which the school is located. Assisting him is an Adjutant and a Supply Officer and a President of the Academic Board appointed by the President of the University or technical school which is under contract with the War Department to give the tuition called for in the prescribed curriculm for U. S. Schools of Military Aeronautics.

For purpose of administrative drill and discipline and candidates at the Schools of Military Aeronautics are organized as a Regiment of two Wings, divided into three and five Squadrons respectively. Each Squadron consists of the members of one class divided into three Flights. Acting, Regimental Wing, Squadron and Flight officers and non-commissioned officers, are temporarily appointed from the candidates. Candidates are quartered in barracks, and eat at the regular mess at which they pay board, which varies in different places according to local conditions but generally amounts to about $1.00 per day. They must meet this out of their pay of $100 per month and 60 cents per diem ration allowance.

The system of discipline follows that of the Military Academy at West Point so far as practicable. Calisthenics and infantry drill are required daily in addition to the course of technical study. Classes are sent to the Schools of Military Aeronautics each Saturday and graduate after eight or nine weeks.

Course of Study

The course of study ordinarily lasts eight weeks and is divided into Junior Wing of three weeks and Senior Wing of five weeks. The work of the Junior Wing consists of intensive training in Military discipline and drill, accompanied by a daily lecture on some military topic, daily instruction in the use of the machine gun and daily instruction in wireless telegraphy.

The work of the Senior Wing includes theoretical and practical instruction in military aeronautics.

Examinations

No candidate will be sent to a flying school who has not passed all final examinations in the ground school. Candidates who fail but have an excellent record for conduct and diligence may at the option of the Commandant be permitted to repeat examinations. Those who fail to pass or whose record for conduct and diligence is not creditable will be recommended for discharge.

The examinations cover the operation and care of aeronautical engines, theory of flight, nomenclature, rigging, care and repair of aeroplanes, principles of cross-country and general flying and aids thereto, reconnaissance, ability to use the artillery picture target and minature range, map reading, principles of and cooperation between aircraft, infantry and artillery, the use and care of machine guns and bombs, signalling, radio, codes, military hygiene, military law and Army paper work and military organization. Successful candidates are marked as having passed, or passed with honor, and are given certificates of graduation issued by the Chief Signal Officer on the recommendation of the Commandant of the school.

Training in Flying

Graduates of the schools of military aeronautics are sent to aviation schools for training in flying. These schools are located in various parts of the United States and in the territories of our allies.

The course of study at the flying schools depends in large measure on the weather, the supply of "spares" and a man's own ability. It cannot be predetermined as to length. Some men pass their R.M.A. test and qualify for their commissions at the end of one month; other require longer. Those who have had previous experience in flying usually require less than others, unless their former instruction has confirmed them in bad habits. It occasionally takes longer to corect bad habits than to teach new candidates who have never had any flying experience at all.

At the flying school instruction in machine guns, signalling, aerial tactics, etc., is continued so far as practicable. As stated above, after a candidate has passed the prescribed tests for a Reserve Military Aviator he is eligible for his commission.

France Honors American Hero's Memory

(*Continued from page* 104)

"Always volunteering for the most perilous missions, impatient to distinguish himself in daring action, never permitting a day to pass without seeking battle, it was constantly necessary to restrain his zeal. He fell gloriously after having given all that his courage promised, the victim of an extremely difficult manoeuvre which brought too severe a strain on the gear of his machine.

"Sergeant Barclay, feeling deeply toward your country for having made for our cause a sacrifice of men like you, even more, if possible, now that your brothers are fighting on our soil for final victory, we bow with emotion and respect before your open grave and pledge ourselves to sacredly guard your memory."

Accompanying a copy of the funeral address, of which the above is a translation, came the engraved copy of the "Citation à l'Ordré de l'Armée," signed by General de Boissoudy, commanding the Seventh Army, and a letter from General Fougeroux, commanding the aerial forces of the Seventh Army, to the Lafayette Escadrille.



A German seaplane being docked after a North Sea reconnaissance flight

NAVAL and MILITARY AERONAUTICS

Aviation Board Appointed

A board of officers to consist of Capt. Adalai H. Gilkeson, junior military aviator, Signal Corps, and First Lieut. Charles Zehnder, Medical Reserve Corps, is appointed to meet at Princeton University, Princeton, N. J., for the purpose of examining applicants for commission in the Aviation Section, Signal Officers' Reserve Corps.

Member of U. S. Air Corps Killed in France

In a cabelgram received yesterday from the Commanding General, American Expeditionary Forces, the following casualty was given: William Mecker, aviation section, on duty with French forces, was killed accidentally, September 12. His father is Henry Mecker, 114 Liberty Street, New York City.

Army Aeronautics

First Lieutenant John Gordon, Jr., Aviation section, Signal Officers' Reserve Corps, to active duty at Fort Wood, N. Y., for temporary duty, and upon the completion thereof will report to the commanding officer of the Signal Corps general supply depot at Richmond, Va., for duty.

First Lieutenant Robertson Griswold, Aviation section, Signal Officers' Reserve Corps, to active duty at School of Military Aeronautics, Cornell University.

Personnel of Army Aviation School at Urbana, Ill.

Capt. George W. Krapf, J. M. A., commandant.
H. W. Miller, president of academic board (captain, Ordnance Department).
First Lieut. Urban B. Harris, medical officer.
Sergt. (First Class) Samuel B. French, adjutant and drill instructor.
Sergt. John Frakes, acting mess sergeant, drill instructor, and assistant to adjutant.
Sergt. Rice.
Private (First Class) Robert Welsch, assistant instructor in rigging; in charge of quartermaster property.
O. S. Beyer, instructor, rigging and engines.
P. S. Biegler, instructor, artillery observation.
J. W. Davis, instructor, wireless.
E. N. Fales, instructor, theory of flight, types of engines.
I. W. Wisk, instructor, engines, magnetoes.
H. F. Godeke, instructor, engines.
G. A. Gross, instructor, rigging, tools.
C. M. Hebbert, instructor, rigging.
E. A. Holbrook, instructor, rigging, nomenclature, bombing.
W. H. Hyslop, instructor, wireless and signaling.
H. H. Jordan, instructor, map reading, photography, meteorology.
C. E. Phelps, instructor, machine guns.
G. W. Pickels, instructor, map reading, instruments, reconnaissance.
G. H. Radebaugh and H. O. Siegmund, instructors, machine guns.
L. A. Wilson, instructor, engines.
F. M. Porter, instructor, artillery observation.
J. R. Lindsey and F. H. Miller, instructors, military science.
Hugh Brown, instructor, signaling.
Gilbert C. Molleson and S. O. Andros, instructors, aerial observation, bombs and bombing.

Aero Squadron Joins Men at Camp Mills

Another important unit for the American overseas fighting forces reached Camp Mills last night. The men will not join the Rainbow Division, but will form the Fifty-fifth Aero Squadron. In the unit are 1,260 men, who have been trained at Fort Sam Houston, Texas.

Capt. V. E. Clark, Jr. Mil. Av., S.C., detailed a member of Joint Army and Navy Technical Aircraft Board, vice Major H. Souther, S.R.C., deceased. (Sept. 11, War D.)

Second Lieut. H. E. Watson, Cav., to Mineola, N. Y., S. C. Av. School, for duty. (Sept. 6, War D.)

The 42d, 43d, 44th and 47th Provisional Aero Squadrons, S. C., Kelly Field, South San Antonio, Capt. T. Deuel in command, to Fairfield, Ohio, for duty. (Aug. 20, S. D.)

The 27th Provisional Aero Squadron, S. C., Kelly Field, South San Antonio, Texas, to Leaside Siding, North Toronto, Canada, reporting upon arrival to Capt. S. W. Fitzgerald, Royal Flying Corps School, that station, for training. (Aug. 14, S. D.)

The 42d, 43d, 44th and 47th Aero Squadrons from Kelly Field, South San Antonio, Texas, to Fairfield, Ohio, for duty. (Aug. 21, S. D.)

The 38th and 39th Aero Squadrons from Kelly Field, South San Antonio, Texas, to Rantoul, Ill., for duty. (Aug. 21, S. D.)

The 40th and 41st Aero Squadrons from Kelly Field, South San Antonio, Texas, to Mount Clemens, Mich., for duty. (Aug. 21, S. D.)

First Lieutenant James A. Langston, Aviation Section, Signal Officers' Reserve Corps, to active duty with Chief Signal Officer of the Army.

First Lieutenant Emory E. Cochran, Aviation Section, Signal Officers' Reserve Corps, to active duty at Fort Douglas, Utah.

First Lieutenant Ryland B. Andrews, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to the chief, War College Division, General Staff, Washington, D. C.

Major Charles E. Mandenhall, Aviation Section, Signal Officers' Reserve Corps, to active duty with Chief Signal Officer of the army.

First Lieutenant Abbot A. Lane, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to the Chief Signal Officer of the army.

First Lieutenant Eckley B. C. Markle, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to commanding officer, School for Aerial Observers, Fort Sill, Okla.

First Lieutenant Henry C. Yarrow, Jr., aviation Section, Signal Officers' Reserve Corps, to active duty and report to Chief Signal Officer of the army.

To Hold Aviation Tests

A board of officers to consist of Capt. Harrison H. C. Richards, junior military aviator, Signal Corps, and First Lieut. Dunbar Roy, Medical Reserve Corps, is appointed to meet at the Georgia Institute of Technology, Atlanta, Ga., for the purpose of examining applicants for commission in the Aviation Section, Signal Officers' Reserve Corps.



Major Hiram Bingham, U. S. R., head of Schools of Military Aeronautics Division

Maj. Waring To Fort Worth

Maj. Charles T. Waring, Signal Corps, will proceed to Dayton, Ohio, on temporary duty in connection with the Aviation Service of the Army, and thence to Fort Worth, Tex., for station. Upon arrival at Fort Worth, Maj. Waring will report by letter to the Chief Signal Officer of the Army.

Aviation Ground School Graduates Sept. 15

The following is a list of the graduates of the aviation ground schools for the week ending September 15:

University of California

David W. Barr, William E. Carroon, Kenneth Decker, Paul E. Freydig, Robert G. Fithian, Russell M. Maughan, Lawrence C. Mann, John A. Macready, Harry O. McDougall, W. B. McLaren, C. L. Nelson, E. M. Ronne, Maple Shappel, and Leslie W. Wishard.

Cornell University

Joseph A. Bettenhausen, Floyd J. Buffington, John P. Cahen, Harry B. Carney, Cahell Carrington, Robert P. Clark, Jr., John W. Hammond, Ralph L. Hartman, Frederick W. Horton, Edwyn Johnstone, Hayden C. Le Roy, Henry S. Loomis, Thomas Munroe, Charles A. Osborne, William E. Rogers, Newton C. Rogers, Frederick C. Spencer, Alvin H. Treadwell, John B. Tubergen, jr., David R. Visel, and William E. White.

University of Georgia

Henry L. Coleman, Arthur J. Gomila, Conrad P. Hazen, Edward B. Henry, R. L. Johnson, Clarence C. Lange, James F. Liles, Giles M. Long, Theodore Maynz, James E. McGehee, Shepard K. Nash, Frederick E. Seiler, jr., Frank B. Tyndell, Marc G. Volk, and Jesse B. Wadsworth, jr.

University of Illinois

Edmund T. Allen, Manford F. Arnold, Joseph E. Beuton, Charles F. Branshaw, W. Erming Daniell, Thomas L. Dawson, Harold B. Davenport, William Ray Ferris, William F. Frank, Oliver P. Gothlin, jr., Wendell G. Greening, James R. Hardendorff, Dean Hole, Merle H. Howe, Carleton H. Jenks, Russel L. Jones, Kenneth Matheson, Joel F. McDavid, Arman L. Merriam, Marland B. Milliard, Clinton M. Peddycoart, Floyd M. Pickerell, Alfred W. Redfield, George O. West, and John W. Williams.

University of Ohio

James L. Bahl, jr., John A. Baird, Henry A. Beckley, James D. Boucher, Arthur F. Clements, Walter W. Cordes, Frank W. Cox, John N. Devoe, Harry Hawkes, Kenneth H. Holdin, Henry B. Hudson, Vaughn J. Jolliff, Ralph B. Jordon, James B. Kincaid, Richard C. Larcomb, Irving N. Larson, Edgar B. Lipsett, Patrick C. Maloney, Waverly F. Melton, Joseph H. Mendenhall, Ernest C. Muchmore, Joseph Anderson Parrish, Charles A. Pavey, Burton D. Raine, Joseph A. Smith, Gerald D. Stivers, George Lewis Sutherland, Harry T. Wilson, and Karl W. Zahner.

Princeton University

Clifford W. Allsop, Richard P. Ash, William McA. Barbour, Edward Butts, jr., Leo B. Canchon, Samuel R. Colton, Harry W. Crumbaugh, Herman Fallot, Edward M. Field, jr., Schuyler E. Grey, Edward M. Haight, Lester S. Harter, Angerean G. Heinsohn, jr., Early J. Hope, Conard G. Johnson, Martin P. Kelly, Morris M. Knowles, John N. Koontz, Lawrence Layton, Frank E. Martin, Richard P. Matthews, Earl N. Neville, Robert P. H. McLean, Alvin E. Peterson, Fred Philbrick, Martin A. Ryan, John D. Sibley, Richard H. Spear, Leonard L. Stanley, Penrose V. Stout, Waldo E. Tuttle, Forest Voeks, Fred L. Walker, Arthur L. Whiton, John D. Wood, and Earl C. Woodsworth.

Assignments

Capt. A. J. Merrill, Aviation Section O. R. C., to Ohio State University, Ohio.

Captain Walter B. Devereux, Jr., Aviation Section, Signal Officers' Reserve Crops, to Governors Island, N. Y., for duty as assistant to the department aeronautical officer.

Signal Corps Regulations.

G.O. 112, Aug. 22, 1917, War Dept.

Officers detailed in or attached to the Aviation Section of the Signal Corps may, under provisions of act approved July 24, 1917, when qualified therefor, be rated as junior military aeronauts, but no person shall be so rated until there shall have been issued to him a certificate to the effect that he is qualified for the rating, and no certificate shall be issued to any such person until an examining board, which shall be composed of two officers of experience of the Aviation Section of the Signal Corps and one medical officer, shall have examined such person for rating and shall have reported him to be qualified according to the following requirements:

(a) The presentation of evidence to the board that the candidate has made at least seven voyages in free balloons, each exceeding one hour in duration, one of which must be made by the candidate alone, and one ascension at night of two hours' minimum comprised between the setting and rising of the sun.

(b) Certificate by two qualified balloon pilots to the effect that they have observed the candidate while on free-balloon voyages and consider that the candidate is qualified to pilot free balloons alone.

(c) Practical experience covering a period of at least three months in the care, repair and maneuvering of free and captive balloons.

(d) Evidence that the candidate has had instruction in meteorology and its applications to aerial navigation, and the manufacture of gases suitable for balloons, and practical experience in observations from captive balloons.

(e) Examining boards are authorized to take into account practical experience in piloting dirigible balloons in lieu of part of the free and captive balloon experience if such substitution appears to be justified and for the best interests of the military service.

By order of the Secretary of War:
H. L. Scott, Major General, Chief of Staff.

Army Regulations

Changes No. 59, Aug. 10, 1917, War Dept.

These made changes in Pars. 377, 378, 385, 521, 733, 1009, 1512¼, and the heading under Article XLII., Army Regulations, and Pars. 208½ and 448½ are added.

448½. The Corps of Engineers is charged with photographic work and records pertaining to terrestrial reconnaissance, surveying, map making, map production, and such special photographic work as may be assigned thereto. The Signal Corps is charged with photographic work and records pertaining to aerial reconnaissance, and such special photographic work as may be assigned thereto. The General Staff Corps is charged with photographic work and records pertaining to the military history of campaigns and of field operations in general, and for this purpose will make use of any available agency existing within the respective tactical commands, such as Engineer or Signal Corps, photographers, or will employ official civilian photographers therefor, as circumstances may warrant.

Army Aeronautics

The following named officers of the Aviation Section, Signal Officers' Reserve Corps, are assigned to active duty and will report to Camp Kelly, South San Antonio, Texas:—Capt. George C. Thomas, Jr., Capt. Loring Pickering, Capt. William E. Goodman, Jr.

Major Walter W. Wynne, junior military aviator, Signal Corps, is relieved from duty at Fairfield, Ohio, and will proceed to Fort Sherman, Canal Zone, and assume command of the Seventh Aero Squadron, relieving Major Clinton W. Russell, junior military aviator, Signal Corps, who upon being thus relieved will proceed to San Antonio, Texas, and report to Camp Kelly, for assignment to duty.

Capt. James E. Stewart, aviation section, is assigned to active duty and will report to Wilbur Wright Field, Fairfield, Ohio.

Capt. Rodman Gilder will proceed to Princeton, N. J., for duty as acting commandant, School of Military Aeronautics.

Aviation Officers

Officers of Av. Sec., S.R.C., to Camp Kelly, San Antonio, Texas, Signal Corps Aviation School, for duty: Capt. A. J. Slade; 1st Lieuts. A. A. Robey, A. C. Yarnall, M. V. Joyes, L. O. McQuitty, C. L. Sanders, E. E. Taylor, E. Ingersoll and R C. Veit. (Sept. 4, War D.)

Capt. A. D. Penny, Av. Sec., S.R.C., to Fort Sill, Okla., School for Aerial Observers, for duty. (Sept. 4, War D.)

Capt. L. A. Donaghue, Av. Sec., S.R.C., to Central Department, Chicago, Ill., for duty. (Sept. 4, War D.)

Capt. G. F. Lee, Av. Sec., S. R. C., to duty and report to C. G., C. D. (Sept. 4, War D.)

First lieutenants of Av. Sec., S. R. C., to duty as follows: R. W. Jannus to S.C. Av. School, Mount Clemens, Mich.; C. A. Campbell to School of Military Aeronautics, Ohio State University, Columbus; H. J. France to Ancon, Panama; F. P. McCreery to Aviation School, Fairfield, Ohio; S. T. Williams to Washington; L. P. McLachlen to Washington; C. W. Handy to Washington; F. G. Rice to Washington; J. B. Stetson, jr., to Mineola, N. Y., Signal Corps Aviation School; H. M. Sadler to Washington; L. O. McQuitty to Belleville, Ill., Sig. Corps Av. School, Scott Field; A. C. Walser to Washington; J. McRae to Mount Clemens, Mich., Sig. Corps Av. School, Selfridge Field. (Sept. 4, War D.)

Officers of Av. Sec., S.C., to duty as follows: Capt. R. Amory report to C.S.O. of Army; 1st Lieut. Q. C. Duke report to C.S.O. of Army; Capt. A. Sweetser report to C.S.O. of Army; 1st Lieut. G. C. Kull to San Diego, Cal., Sig. Corps Av. School; 1st Lieut. R. R. McMath to Av. School, Mineola, N.Y. (Sept. 5, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Major F. B. Longley to Sig. Corps Av. School, San Diego, Cal.; 1st Lieut. J. F. McGough report to C.S.O. of Army; 1st Lieut. W. W. Lanahan to Champaign, Ill., School of Military Aeronautics, University of Illinois. (Sept. 6, War D.)

First Lieuts. J. Q. Stewart and N. R. French, Av. Sec., S.R.C., to Princeton University, N.J., for duty. (Sept. 8, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Capt. W. B. Devereux, jr., to Governors Island, N.Y.; 1st Lieut. L. F. Lanham to Fort Sill, Okla.; 1st Lieut. L. Stocker to Mineola, N.Y.; 1st Lieut. F. Crampton to C.S.O.; 1st Lieut. J. C. Mars to Washington, D.C.; 1st Lieut. W. Houghteling to C.S.O.; 1st Lieut. H. K. Kicklighter to Washington; 1st Lieut. G. Munn to Army War College, Washington, D.C.; 1st Lieut. W. H. Sears to Ancon, C.Z. (Sept. 7, War D.)

First lieutenants of Av. Sec., S.R.C., to duty as follows: H. C. Sigourney to Washington; J. S. Rogan to School of Military Aeronautics, Austin, Texas; P. V. Pennybacker to School of Military Aeronautics, Austin, Texas; D. F. B. Hickey to Washington; J. F. Beecher to Fort Wood, N.Y. (Sept. 7, War D.)

First lieutenants of Av. Sec., S.R.C., to duty Camp Kelly, San Antonio: G. Dodge, S. H. Mapes, R. E. Lassiter, W. R. Gehan, B. W. Warner, J. Pollock, J. A. Herlihy, H. T. Fleitmann, R. Cheston, jr., G. P. Texada, de B. K. Seeley, H. M. Warfield, jr., K. M. Spence and G. W. Rupp. (Sept. 7, War D.)

First Lieuts. B. S. Robertson, jr., and R. A. Dunn, Av. Sec., S.R.C., to Sig. Corps Av. School, Chanute Field, Mount Clemens, Mich., for duty (Sept. 11, War D.)

First lieutenants of Av. Sec., S.R.C., to duty at Camp Kelly, San Antonio, Texas: R. H. Skeels, H. S. Alexander, M. I. Keim, R. K. Goodenow, jr., J. B. H. Smith, R. E. Brady, H. W. Lake and P. Wyman. (Sept. 8, War D.)

Capt. A. J. Merrill, Av. Sec., S.R.C., to School of Military Aeronautics, Ohio State University, Ohio, for duty. (Sept. 10, War D.)

First Lieut. C. DuBosque, Av. Sec., S.R.C., report to C.S.O. for duty. (Sept. 10, War D.)

First Lieut L. Watson, Av. Sec., S.R.C., to Boston, Mass., for duty as department aeronautical officer, relieving 1st Lieut. C. J. Glidden, S.R.C., who will proceed to Fort Omaha for duty. (Sept. 10, War D.)

Officers of Av. Sec., S.R.C., to Camp Kelly, Texas, for duty; Capts. W. B. Bovard and C. M. Fleischman; 1st Lieuts. W. J. Dunn, jr., A. P. Hume, S. D. Marvil, H. Robertson, G. Roberts, E. A. Robinson, W. E. Engel, J. J. Cody, O. B. Hanson, T. H. Jarrell, R. H. Rogers and W. J. Jacobi. (Sept. 10, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Capt. S. B. French to School of Military Aeronautics, University of Illinois, Champaign, Ill.; Capt. M. L. King to Fort Sill; 1st Lieut. C. A. Phillips to San Antonio, Texas, Camp Kelly; 1st Lieut. H. Imbrie to Washington; 1st Lieut. W. H. Warren to Harrisburg, Pa.; Capt. J. R. Moulthrop to Chief Signal Officer; 1st Lieut. F. F. Christine to Washington; 1st Lieut. R. Griswold to Cornell University; 1st Lieut. J. Gordon, jr., to Richmond, Va.; 1st Lieut. H. Green to Washington; 1st Lieut. F. H. Sholtz to Chicago; 1st Lieut. C. Payne to Richmond, Va. (Sept. 11, War D.)

Officers of Av. Sec. S.R.C., to Camp Kelly, South San Antonio, Texas, for duty; Capts. G. C. Thomas, jr., and H. L. Lyster; 1st Lieuts. W. S. Reyburn, J. W. Frewer, J. R. Ferry, J. E. Manierre, J. D. Morey, C. A. Reid, C. G. Spencer, W. P. Fuller and P. S. Park, jr. (Sept 11, War D.)

Officers of Av. Sec., S.R.C., to Camp Kelly, Texas, for duty: 1st. Lieuts. P. A. Beaton, F. H. Miller, J. A. Larkin, J. P. Argersinger, R. S. Ripley, A. B. Lapsley, W. H. Y. Hackett, E. A. Waters, W. I. Waite, C. H. Marshall and W. B Pettus. (Sept. 11, War D.)

Officers of Av. Sec., S.R.C., to duty as follows: Capt. G. Reel and 1st Lieut. D. H. Mills to South San Antonio, Tex., Camp Kelly; 1st Lieut. T. Boland to Toronto, Canada, U.S. Aviation Troops; 1st. Lieut. A. G. Fox to Richmond, Va. (Sept. 12, War. D.)



Group of members of the Joint Army and Navy Board of Design and Specifications. From left to right, standing: Captain E. S. Gorrell, U. S. A.; Assistant Naval Constructor Jerome C. Hunsaker, U. S. N.; Lieut. Com. John H. Towers, Captain V. E. Clark, U. S. A. Sitting: Lieut. Com. A. K. Atkins, U. S. N.; Major B. D. Foulois, U. S. A.

THE LAWSON PRIMARY TRAINING TRACTOR



ONE of the chief claims for superior performance of the Lawson Primary Training tractor is in its slow speed, for it is claimed that the machine can be made to fly at a speed as low as 37 miles an hour, and increased to 66 miles an hour. Such a range in speed is desirable for preliminary military training, but the same characteristic makes it a good reconnaissance machine, for spotting artillery back of the enemy's lines. As it is capable of hovering over certain positions, photographic information is more readily obtained than with the speedier machines.

When the Lawson Aircraft Corporation was established at Green Bay, Wisconsin, the intention was to turn out the first machine in four months, and the plan was successfully carried out. It is expected that with the parts standardized to a great extent, rapid production will proceed without difficulty.

The main dimensions and specifications of the Lawson Military Tractor Biplane, which has been designated as the "Model M. T. 1 Primary Training Type," are as follows:

General Dimensions

Span, upper plane	44′-6″
Span, lower plane	32′-6″
Chord, upper plane	7′-0″
Chord, lower plane	6′-5″
Gap between planes	6′-9″
Stagger	9°
Length over all	25′-6″
Height over all	10′-0″
Weight, empty	1300 lbs.
Weight, loaded	1900 lbs.
Speed range	37-66 m.p.h.
Climb in 10 minutes	2600 ft.
Gliding angle, machine loaded	1 in 8
Motor, Hall Scott	100 H.P.

Planes

There is no sweepback to the planes. Dihedral angle, 1 degree. Both upper and lower planes are set at an incidence angle of 4½ degrees. The wing curve of both planes is the "USA 3." The wing loading per square foot equals 4.5 lbs.

Main planes are in five sections; the center panel, above the fuselage, is 4 feet wide; main top panels each 20′-0″ in span. The ailerons are recessed in the top planes with their trailing edges on line with the main plane. Ailerons 9′-7″ long, their ends reaching a maximum distance of 3 inches beyond the rear main wing spar, and bringing the wing span to 44′-6″. Ailerons have a uniform width of 2′-8″.

The overhang wires are carried on 15″ struts above the upper plane. The planes are braced against drift by cables from the upper rear wing beam to the nose plate of the fuselage.

Fuselage

The longerons are of ash and spruce, channeled on four faces for lightness between the struts to the rear of pilot's seat, and solid forward. Top longerons run as far as the front pair of struts carrying the central wing panel; lower longerons run as far as the strut running from the forward wheel. From the ends of the longerons, the motor is carried on channeled ash beds braced by steel tubing. The curved portion of lower longerons are wrapped with fabric.

The pilot's and passenger's seats are carried on a single pair of channeled spruce stringers, parallel to the upper longeron. The wooden cockpit floor is supported underneath by lightened veneer arches. Dual stick control is installed for the ailerons and elevators, and double foot bars for the rudder.

The main fuel tank is located above and forward of the passenger's seat, resting on the upper longerons, with top rounded to fit the space beneath the cowling. A filler cap at the top allows it to be filled from the outside of the machine. An aluminum wall separates the motor compartment from the forward cockpit.

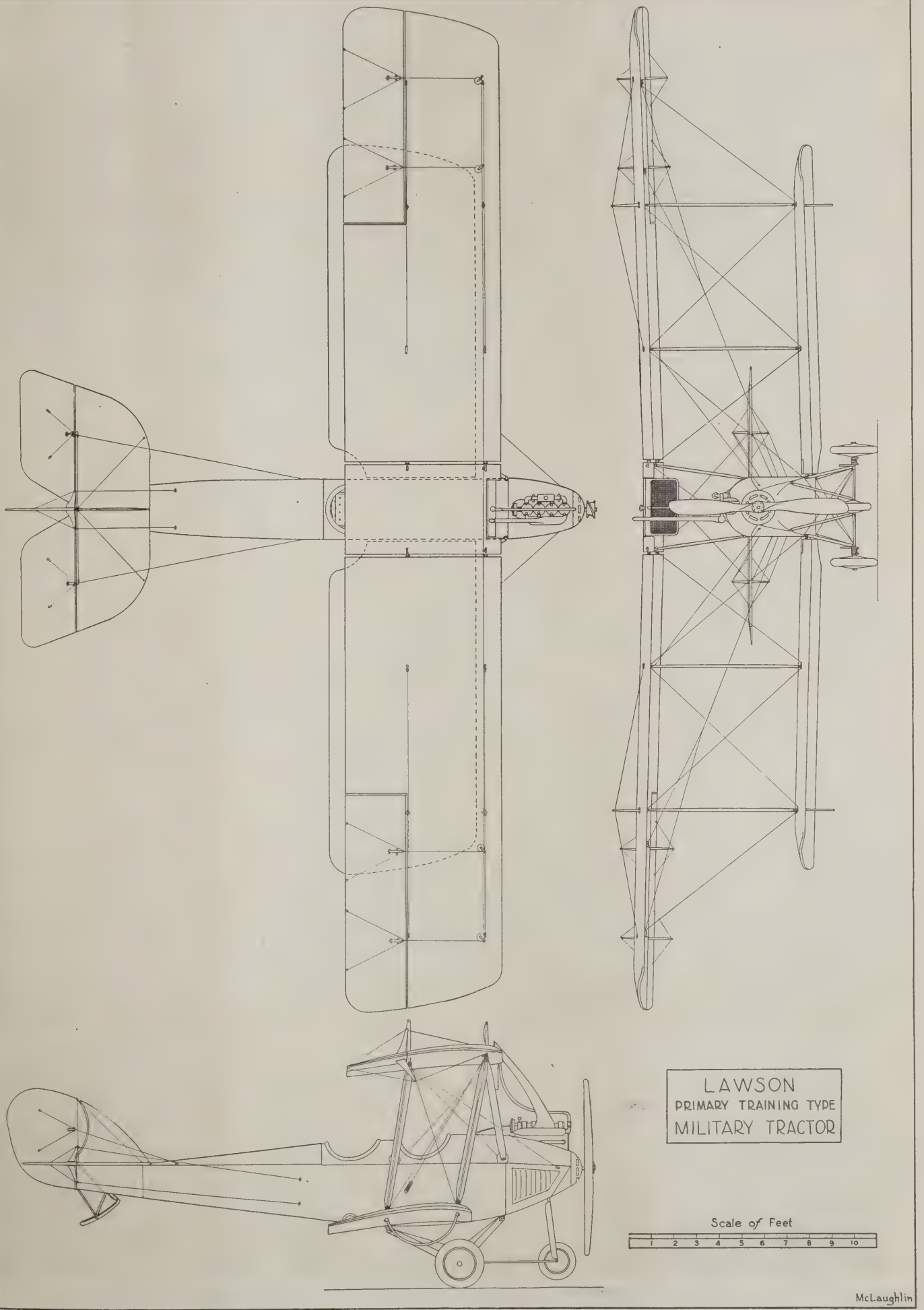
Landing Chassis

Three wheels are employed on the landing gear, the forward small wheel preventing nosing over in landing on rough

(*Continued on page* 123)



The Lawson Aircraft Corporation's primary training tractor, equipped with a Hall-Scott 100 H.P. motor


LAWSON
PRIMARY TRAINING TYPE
MILITARY TRACTOR
Scale of Feet
1 2 3 4 5 6 7 8 9 10
McLaughlin

THEORY OF PRESSURE ON A PLANE SURFACE DUE TO RELATIVE WIND

By A. E. WATSON

In dealing from the theoretical standpoint with what, in a general way, may be termed wind-pressure on a surface, we are concerned only with relative movement of the surface and gaseous medium under consideration. It is convenient to consider the medium, such as air, to be at rest, and the relative wind to be due to movement of the surface through the medium. In establishing an expression for the pressure, the Newtonian method of determining the change of momentum at the surface in unit time is usually adopted, the reasoning being somewhat as follows. Conceive a plane of unit area to be moving through still air of density ρ at a velocity v, all points of the surface moving parallel to a line making an angle θ with the surface. In unit time the surface sweeps out a column of air of cross-sectional area $\sin\theta$ and length v, its volume being $v \sin\theta$ and its mass $\rho v \sin\theta$. To this air is imparted a velocity $v \sin\theta$, the component of the velocity v normal to the surface. The momentum imparted is therefore $\rho v^2 \sin^2\theta$, and is a measure of the force acting on unit surface (pressure) throughout the motion. When θ is a right-angle the relative wind is normal to the surface, and $\sin^2\theta$ is unity. The above reasoning leads to an expression of the form pressure $= k \rho v^2$ when the relative wind impinges normally on the surface, the coefficient k depending on such considerations as the form and area of the surface, and being introduced to make theory fit practice.

The underlying principle of determining the force acting from the change of momentum is, of course, physically sound, but the particular application given above appears to the writer to be unsound, for reasons which we endeavour to make clear in what follows. The aim of this article is, however, not to present a cut-and-dried theory with an air of finality, but to suggest a line of thought which is at least interesting, and which, it is to be hoped, will prove fruitful.

According to the expression given above the pressure varies as the square of the velocity, but there is reason to believe that this is not strictly accurate. At low velocities the pressure appears to vary as the velocity, and at very high velocities as the cube or higher power. A possible explanation of this will be found in the development of theory given herein. When v is zero the above expression gives zero pressure. The condition $v = 0$ would correspond to the surface being at rest in still air. A theory which says that the pressure is zero under conditions in which, as a matter of fact, if we take the atmospheric pressure as 14·7 lbs. on the square inch, the pressure on a square foot is nearly one ton, is obviously unsatisfactory. To this it may be objected that the expression is only intended to give the increase of pressure due to relative wind, and that the total pressure would be obtained by adding the atmospheric pressure, so that the complete expression would be of the form pressure $= k\rho v^2 + c$ where c is the atmospheric pressure. Such procedure is, however, arbitrary and unscientific, and moreover is not justified by the physical considerations on which the expression is established. Further, such procedure does not remove a second objection, that the theory given does not enable us to calculate or account for the decrease of pressure on the back of the moving plane.

It will be seen that the "square" law set out above rests on an assumption that each and every particle or molecule of the gas has the same relative velocity with respect to the plane, that this relative velocity is determined entirely by the movement of the plane through the medium, and that when such movement ceases relative movement of necessity ceases also. In short, the gaseous medium is regarded as though its constituent molecules had no movement of their own. It should be obvious that no consistent thinker can assent to this view of the gaseous medium and at the same time assent to the kinetic theory of gases.

According to the kinetic theory the molecules of a gas (which, in an ordinary way and considered as a whole, is at rest) are individually possessed of rapid translatory movement, and the so-called static pressure exerted by the gas on any surface with which it is in contact is explained by the impacts of the gas particles against the surface. This movement decreases as the temperature of the gas falls, and is accompanied by a corresponding decrease in the pressure exerted. The movement ceases and the pressure simultaneously becomes zero when the temperature reached is that known as absolute zero. In this condition the gas would conform to the conception of the medium used above in establishing the expression for pressure due to relative wind, and the "square" law would hold good. At ordinary temperatures, however, the "molecular velocity," as the velocity of the constituent particles according to kinetic theory may be termed, is, in the case of air at atmospheric pressure, of the order of a thousand miles or more an hour, which is by no means negligible. If, then, the molecular velocity of kinetic theory has any counterpart in fact, such molecular velocity must be taken into account in any theory of pressure due to relative wind which has any pretence to completeness. In short, such theory must be based on the relative movement of individual particles (or of streams of such particles as have the same relative movement) with respect to the plane, as determined by compounding the velocity v of the plane with the molecular velocity V of such particles or streams. At first thought it might be concluded hastily that such treatment of the problem belongs to the realm of impossibility. As a matter of fact, on the assumptions made in developing accepted kinetic theory, the treatment is comparatively simple. In establishing an expression for the static pressure exerted by a gas on a surface in contact therewith, assumptions are made

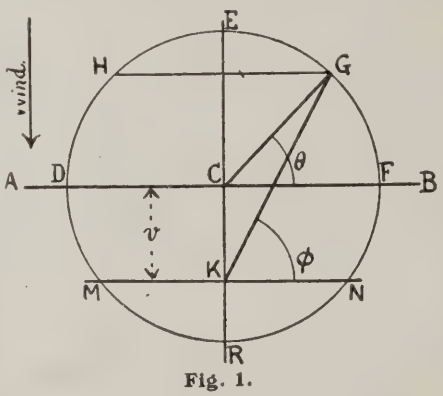


Fig. 1.

which, in effect, amount to assuming that the surface is bombarded equally from all possible directions by streams of gas particles, the streams having the same density (d, say) and velocity V. Thus, if AB (Fig. 1) represents a plane, and we confine our attention to a small element of area approximating in magnitude to a point C, the streams may be represented, as regards velocity and direction, by the radii of a sphere DEF having its centre at C, the radii being regarded as directed towards the centre. As we are here concerned with a relative movement determined entirely by the molecular velocity V, the Newtonian method given above is applicable, and the pressure on the element of area at C due to any stream represented, for instance, by GC, is given by the expression $dV^2 \sin^2\theta$, where θ is the angle GCF. The total pressure on the element of area is the sum of the pressures due to the individual streams. If we distinguish the inclinations of these streams by subscripts 1, 2, 3, &c., the total pressure p is given by

$$p = dV^2 (\sin^2\theta_1 + \sin^2\theta_2 + \sin^2\theta_3 \ldots \&c.) \quad (1)$$

If there are n streams, there will be n terms within the brackets, and we may write the above expression in the form

$$p = ndV^2 \left(\frac{\sin^2\theta_1 + \sin^2\theta_2 + \ldots \text{ to } n \text{ terms}}{n} \right) \quad (2)$$

The expression within brackets is the mean value of $\sin^2\theta$ for all the streams, and nd is the total density of all the streams, and is therefore equal to ρ, the density of the gas. To find the mean value of $\sin^2\theta$ for all possible radii uniformly distributed throughout the hemisphere, it is convenient to associate mentally the distribution of the radii with the distribution of their outer extremities over the hemispherical surface. These extremities will be uniformly distributed, and the mean value of $\sin^2\theta$ is then obtained from the expression

$$\frac{1}{A} \int \sin^2\theta \, dA \quad (3)$$

where A is the area of the surface over which the integration is performed, and dA is an element of that surface. In the present case A is the area of the hemispherical surface, given by $2\pi V^2$ (since V is the radius of the sphere of reference).

We may take for the element dA a zone GH for all points on which θ has the same value. The length of this zone is $2\pi V \cos\theta$, and its width V $d\theta$, so that $dA = 2\pi V^2 \cos\theta \, d\theta$.

The limits of θ are $\frac{\pi}{2}$ and o, so that (3) becomes

$$\int_0^{\frac{\pi}{2}} \sin^2\theta . \cos\theta . d\theta = \left[\frac{\sin^2\theta}{3} \right]_0^{\frac{\pi}{2}} = \frac{1}{3}$$

The pressure of the gas is therefore given by $p = a\frac{V^2}{3}$, which is the usually accepted value.

In spite of the apparently straightforward character of the reasoning establishing the expression $dV^2\sin^2\theta$ for the pressure of the individual stream, the writer has grounds (which we need not here examine) for believing that the reasoning is unsound physically, and that the correct expression is $dV^2 \sin\theta$. With this view, the pressure of the gas depends on the mean value of $\sin\theta$, given by

$$\int_0^{\frac{\pi}{2}} \sin\theta . \cos\theta . d\theta = \left[\frac{\sin^2\theta}{2} \right]_0^{\frac{\pi}{2}} = \frac{1}{2},$$

so that $p = \rho\frac{V^2}{2}$.

If the constituent streams were of the same density d, but their velocities different, the pressure would be given by the expression

$$p = \rho \left(\frac{(V_1^2\sin^2\theta_1 + V_2^2\sin^2\theta_2, \&c., \text{ to } n \text{ terms}}{n} \right) \quad (4)$$

in one case, or by

$$p = \rho \left(\frac{(V_1^2\sin\theta_1 + V_2^2\sin\theta_2, \&c., \text{ to } n \text{ terms}}{n} \right) \quad (5)$$

in the other, where V_1, V_2, &c., are the velocities of the stream inclined at angles θ_1, θ_2, &c., respectively.

According to accepted theory, the velocity of sound (V_s) in a gas is given by

$$V_s = \sqrt{\frac{\gamma p}{\rho}} \quad (6)$$

where γ is the ratio of specific heats, p the pressure, and ρ the density of the gas. For a gas for which $p = \rho\frac{V^2}{3}$ it can be shown that $\gamma = 1\frac{2}{3}$. Substituting these values in (6) we get

$$V_s = \sqrt{\frac{5V^2}{9}} \cdot 74 \text{ V approximately,}$$

or $$V = 134 \, V_s \text{ approximately.}$$

On the other hand, when $p = \rho\frac{V^2}{2}$ we find that $\gamma = 2$, and substituting these values we get $V_s = V$, or the velocity of sound and the molecular velocity are identical. This is in agreement with what we should expect from the consideration that if we slightly disturb the molecular velocity as by a vibrating string in producing a sound, the disturbance should be propagated with a velocity tending to a minimum agreeing with the molecular velocity of the particles, which serve as carriers. It is difficult to see any clear reason why, in a gas having a constitution such as is contemplated in the foregoing theory, the disturbance should be propagated with a velocity some 25 per cent. less than that of the gas particles. We state thus much merely to show that the alternative expression (5) is not entirely irrational, and, for what it may be worth in the absence of exhaustive discussion, will give below the alternative development somewhat briefly after developing the orthodox view more fully.

It will be convenient first to draw attention to a distinction usually made between elastic and inelastic impacts. If a mass m impacts against a plane surface with a velocity component v normal to the surface, the normal component is destroyed when the impact is inelastic, the change of momentum being mv. If the impact, however, is perfectly elastic, the mass rebounds with a normal component v, the change of momentum being $2mv$. If the periods of contact are the same in the two cases, the average force exerted during the elastic impact is twice the force exerted during the inelastic impact. Applying this reasoning to the impact of gas particles, it is sometimes stated that the pressure for inelastic impacts is given by ρV^2 and for elastic impacts

by $2\rho V^2$. It should be noted that this is only true when ρ stands for the density of the incident stream. When ρ stands for the density of the gas in the immediate vicinity of the plane, the pressure is given by ρV^2 in both cases, for when the impacts are inelastic there are no reflected streams present, and ρ is the density of the incident stream. When the impacts are elastic, reflected streams are present. As a reflected stream is merely an incident stream at a later period in its history, the incident and reflected streams have, of necessity, the same density. In this case, therefore, the density of the incident stream is $\frac{\rho}{2}$, yielding ρV^2 as the expression for pressure. In the present paper the elastic impact view is taken. Thus, considering the pressure on the upper surface of the element at C (Fig. 1), we may associate the velocity and direction of incident streams with the radii of the hemisphere DEF, and of the reflected streams with the hemisphere DRF. When dealing with the lower surface of the element at C, these associations would, of course, be reversed.

Now, assuming the plane AB to move with a velocity v in the direction CE, the result would be equivalent to imposing on any stream GC a corresponding velocity with respect to the plane in the direction EC. If we make $CK = v$, and join GK, GK gives, as regards magnitude and direction, the resultant velocity of the stream with respect to the plane. Similarly the resultant velocities of other streams are given by joining the corresponding points on the spherical surface to the point K. The surface is therefore bombarded now by streams parallel to these resultants. Confining our attention as before to a small element of surface, we may consider the plane as occupying the position MKN with respect to the sphere of reference, and regard K as the element in question. Now when the plane moves with a velocity v it will clearly overtake those reflected streams which, when the plane was at rest, were moving away with normal velocity components ($V \sin \theta$) less than v. These streams correspond to the radii terminating on the zone DMNF. There will be a corresponding increase in the number of impacts in unit time which will be equivalent to an increase in the effective density of the incident streams in the ratio



One of the latest German flying boats in which it will be seen steel tubing plays an important part

$$\frac{\text{surface MEN}}{\text{surface DEF}} = \frac{V + v}{V}.$$

As reflected streams are automatically produced corresponding to the incident streams, it follows that there will be an increase in the actual density of the gas in the immediate vicinity of the surface. This reasoning leads to the interesting result that the density of the gas in the immediate vicinity of the front surface of the moving plane increases in the ratio $\frac{V + v}{V}$, and the limit is reached when $v = V$ so that the density is doubled. All the streams, both incident and reflected, originally present when the plane was at rest are now incident, and there can be no further increase in density, no matter how much higher we make the velocity v.

It will be seen by comparison with (4) above that the pressure on the element K will be found by finding the mean value of $a^2 \sin^2 \phi$ over the surface MEN and applying this mean value to gas of density $\frac{\rho (V + v)}{V}$, where a is the resultant velocity GK for any stream and ϕ the corresponding angle of inclination GKN. Thus

$$p = \rho . \frac{(V + v)}{V} . \frac{1}{A} \int a^2 \sin^2 \phi . dA. \qquad (7)$$

Taking, as before, for the element dA the zone GH for all points on which $a^2 \sin^2 \phi$ has the same value, we have

$$dA = 2\pi V^2 \cos \theta . d\theta$$

and

$$A = 2\pi V^2 . \left(\frac{V + v}{V} \right).$$

Substituting in (7) we get

$$p = \rho \int a^2 \sin^2 \phi \cos \theta . d\theta \qquad (8)$$

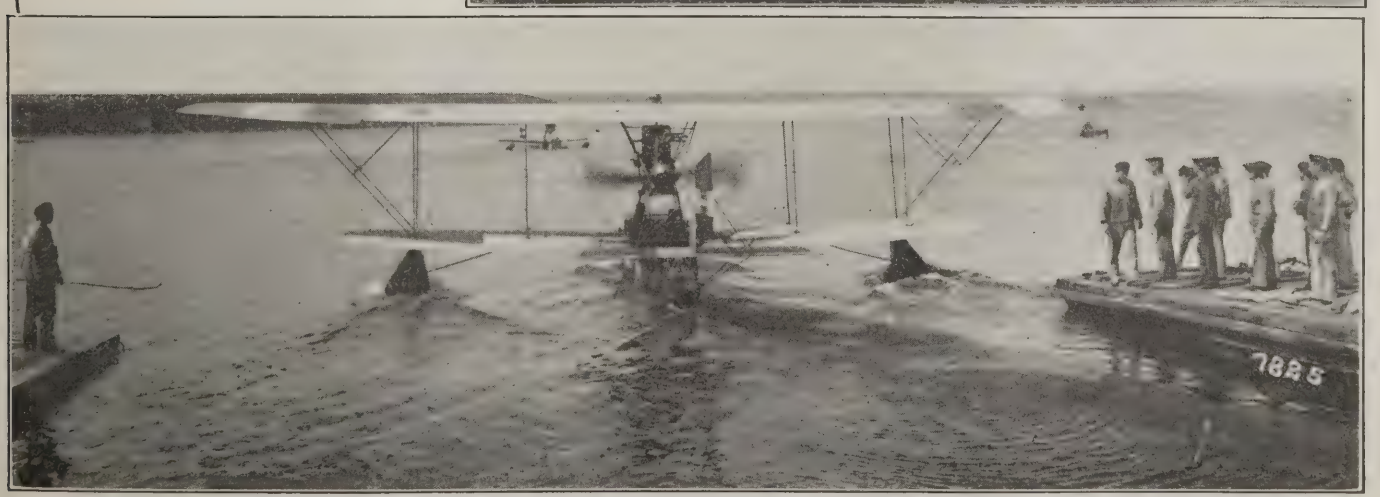
the integration being performed between limits corresponding to the surface MEN.

(To be concluded.)

On the right, a close up view of a German flying boat, showing some new features of construction

Below, the same type of craft getting away for a flight





THE 260 H. P. MERCEDES MOTOR

(*Continued from page* 21)

Lubrication

Although the general lubrication system of the engine is arranged on normal principles, it appears advisable to deal with the various details of the somewhat complicated plunger type oil pump, and to describe their different functions in relation to the method of lubricating the various parts of the engine. The system may be sub-divided into three circuits:

(*a*) The main pressure circuit, in which oil is drawn from the main oil sump at the rear of the engine and forced to the crankshaft, connecting rods, camshaft bearings, etc.

(*b*) The supplementary pressure system that works in conjunction with the main high pressure system, in which two auxiliary plungers of the main oil pump draw a small charge of fresh oil from the service oil tank at every stroke, and thus keep the main circulation supplied with a certain quantity of fresh oil.

(*c*) A suction "scavenging" circuit, which supplies the main oil sump from the auxiliary drain sump at the front of the base chamber, the working oil level being maintained in the rear sump by a secondary suction pump that draws off the oil above the oil level through an overflow pipe and returns it to the service oil tank.

The Oil Pump

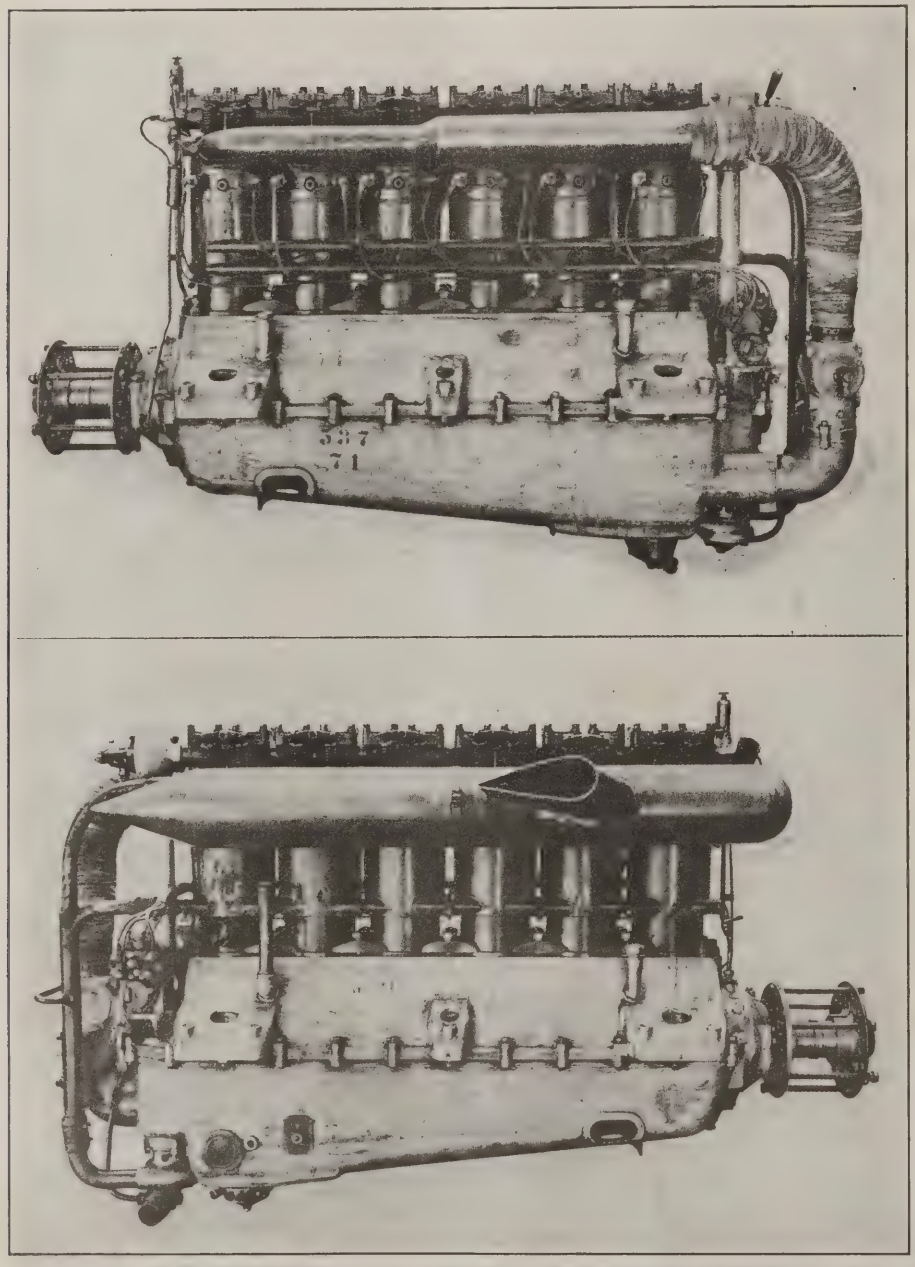
Two main plungers for suction and delivery are employed, while three auxiliary plungers are suspended from one of the main pump plungers; these work in conjunction with piston valve plungers at the sides of the main pump.

Each pump and valve plunger is operated by an eccentric, and the eccentric spindle is arranged transversely to the engine crankshaft; it is driven by worm gear from a layshaft at a 17 to 1 ratio to engine speed. The layshaft is driven by bevel gearing from the vertical driving-shaft of the water pump, this being in turn driven from the main bevel gear pinion on the rear end of the crankshaft, as shown in the general arrangement drawing of the engine, fig. 11.

The functioning of the oil pump will perhaps best be grasped by reference to the diagrammatic section (fig. 12), and, considering first the main pressure system of lubrication to the main bearings, its action is as follows: Oil is drawn from the main sump through the wire gauze filter in the bottom of the oil pump body by the suction of the main plunger pump A through the port B (which is cut in the bottom of the pump barrel), in conjunction with the piston valve C, when the latter is in the open position with the port B.

On the downward stroke of the main plunger A the oil is forced through the port B and the annular space above the piston valve C, through the main delivery pipe D, to the main bearings, when the piston valve C has uncovered the port B on its downward stroke.

Simultaneously, and in conjunction with the main plunger A, the auxiliary plunger



The 260 H.P. Mercedes aircraft engine. Induction and exhaust sides

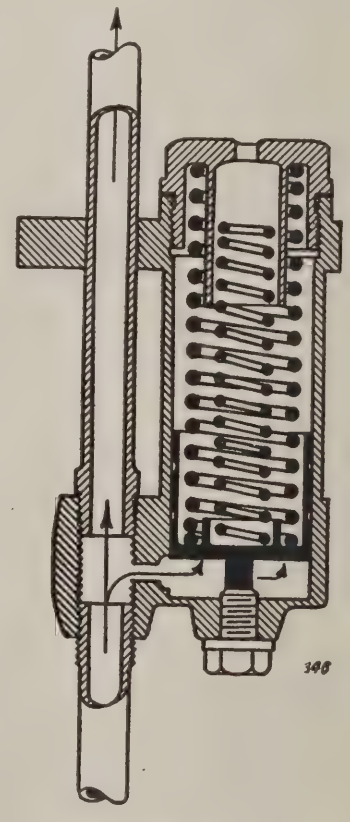


Fig. 10.
Oil pulsation damper valve.

E, which is fitted to the bottom of the plunger A, draws a charge of fresh oil on its upward stroke. This charge is taken through a port in the bottom end of the valve plunger from the oil service tank, through the pipe G, and on the downward stroke of the plunger pump E; the charge of oil is forced upwards through the hollow valve plunger, through the port H, and through a hole in the stem of the plunger, which communicates with the main oil delivery pipe D, to the main bearings. At the same time, and in

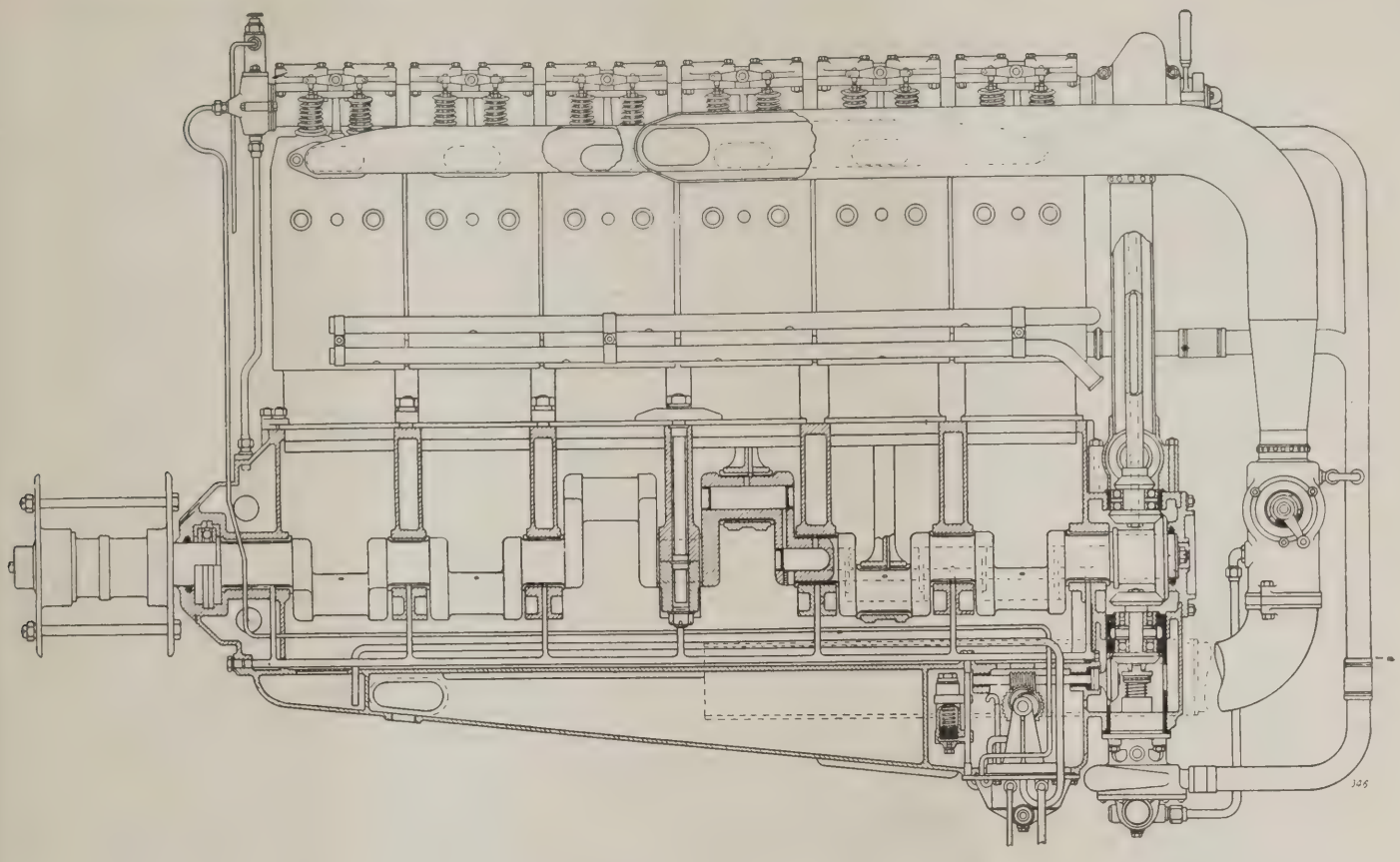


Fig. 11.

GENERAL ARRANGEMENT OF 260 H.P. MERCÉDÈS AIRCRAFT ENGINE. 160 MM. BORE × 160 MM. STROKE.

the same sequence, the twin plunger EI draws fresh oil from the service tank, and forces the charge to the camshaft bearings through the pipe J, the oil entering the front end of the camshaft through the hollow spindle of the air pump, which is attached to the fornt end of the camshaft casing. In its passage through the hollow camshaft the oil under pressure is fed thorugh small holes and oil grooves cut in each of the camshaft bearings.

The camshaft rocker arm spindles are lubricated by oil thrown off the revolving cams, which deliver oil into two holes drilled side by side in the upper portion of the hollow rocker arm spindles. These holes communicate with the bearings by small holes drilled radially in the spindle. The lubrication of the rocker arm does not appear to have been very efficiently carried out, as it was noticed that one or more of the spindles had commenced to seize in the cast iron bracket in the camshaft casing.

No outlet holes are provided in the rear end of the camshaft for the egress of oil; consequently the camshaft is entirely under a constant oil pressure, which finds its way through the bearings into the troughs in the bottom of the camshaft housing. The overflow oil returns to the crankcase via the air pump, escaping therefrom at the bottom of the air pump crank case by a 12 mm. pipe running down to the front end of the engine. At the rear end of the camshaft casing oil escapes down the hollow vertical shaft, oil channels being cut in the underside of each of the camshaft bearing bushes for the purpose.

The oil that has thus returned by gravity to the crank case is led into the oil sump at the rear through two holes 30 mm. diameter, drilled in the false bottom of the base, and at the forward end of the crank chamber the oil flows into the front auxiliary sump through a wire gauze filter already referred to.

From the front, or auxiliary, sump the oil is drawn by the "scavenger" pump K, fig. 12, through the port L (cut in the bottom of the barrel), the piston valve M being in its upward position. The oil therefore enters the pump through the

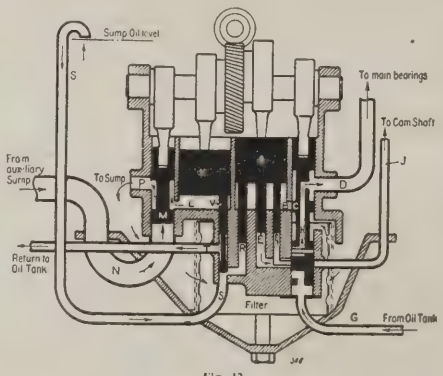


Fig 12.
Diagram of oil pump.

large suction pipe N, and is discharged on the downward stroke of the pump plunger K into the sump through the port P, drilled in the side of the piston valve barrel.

To maintain the correct working oil level in the sump, a third plunger R, also attached to the bottom of the main plunger pump A, draws off, through the bent-over suction pipe S, any surplus oil above the working level in the sump, and returns it to the oil service tank through the pipe T, on the downward stroke of the plunger R, this plunger, working in conjunction with the piston valve V, which is flexibly attached to the bottom of the suction pump K, in a slot cut in the face of the pump. In the main pressure delivery pipe to the crankshaft bearings, and directly above the oil pump, the pulsation damper valve is located. The details of this valve are shown in fig. 10, while its exact position may be seen by reference to the general arrangement drawing of the engine, fig. 11.

In operation the pulsations of the oil pump plungers are damped out in the delivery pipe by the cushioning effect of the spring-loaded plunger, which communicates direct with the pump on its underside. The bottom face of the plunger is prevented from reaching the bottom of the barrel by a small set-screw in the base.

The lubrication of the crankshaft and connecting rod bearings is on standard lines, and has already been referred to; details of this are shown in the general arrangement of the engine.

Carburetor and Induction System

Notwithstanding the large size of the engine only one carburetor is employed, and, as will be seen from the illustrations, this is situated low down at the rear end of the crank case. Below the float chamber a petrol filter chamber is attached, the petrol entering through a gauze cylindrical filter tube that is screwed into the top of the filter chamber, as shown in fig. 13. Petrol enters the bottom of the float chamber, which is of the ordinary balanced needle valve type.

The main jet, which is a plain tube having an orifice of 2.3 mm. diameter, is situated in the centre of the intake inside the choke tube. The choke tube is 32 mm. diameter at the waist and 54 mm. diameter

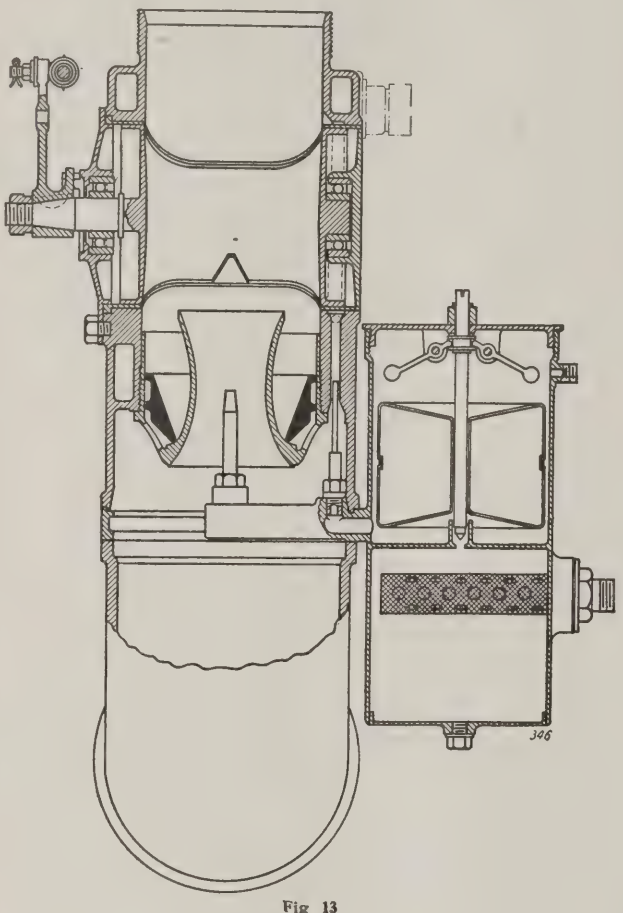


Fig 13
Arrangement of carburetter

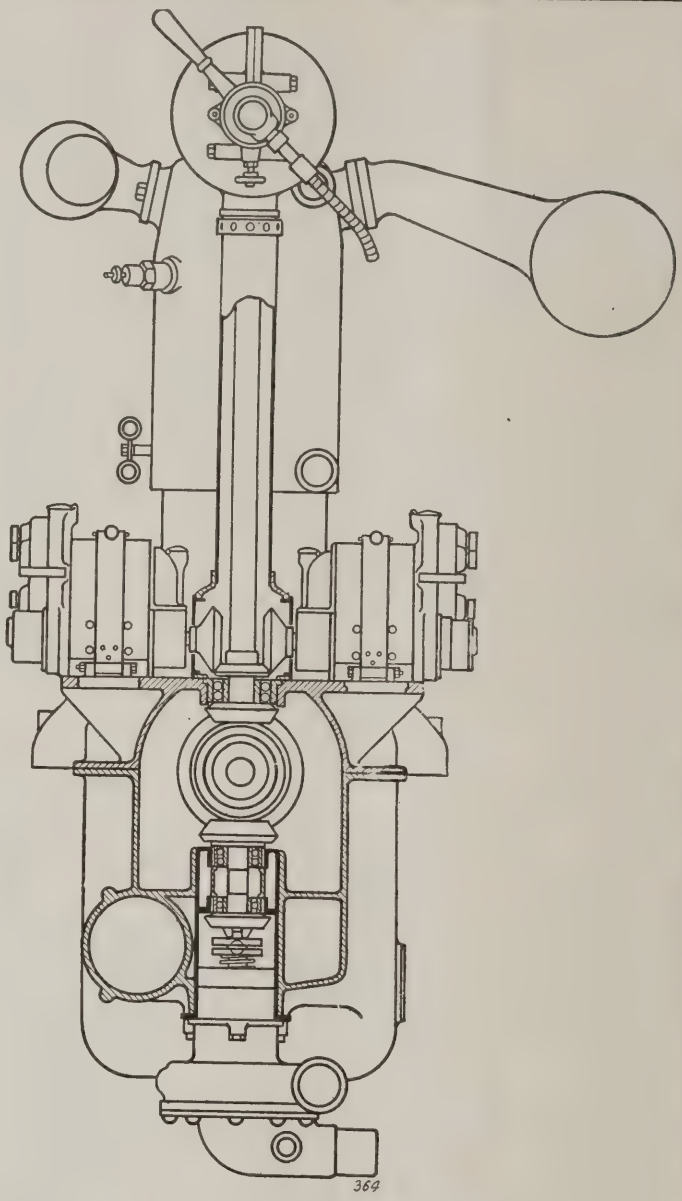


Fig. 14.
Arrangement of camshaft vertical drive.

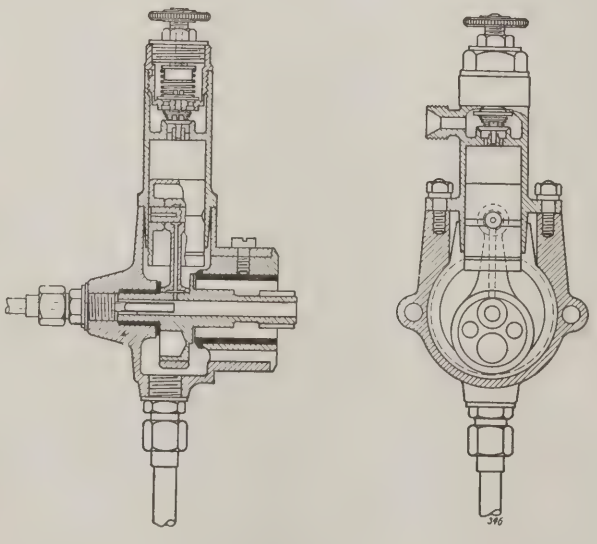


Fig. 15.
Arrangement of air pump.

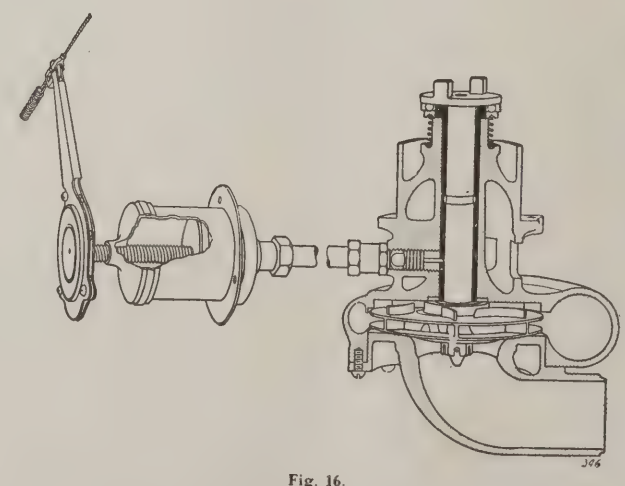
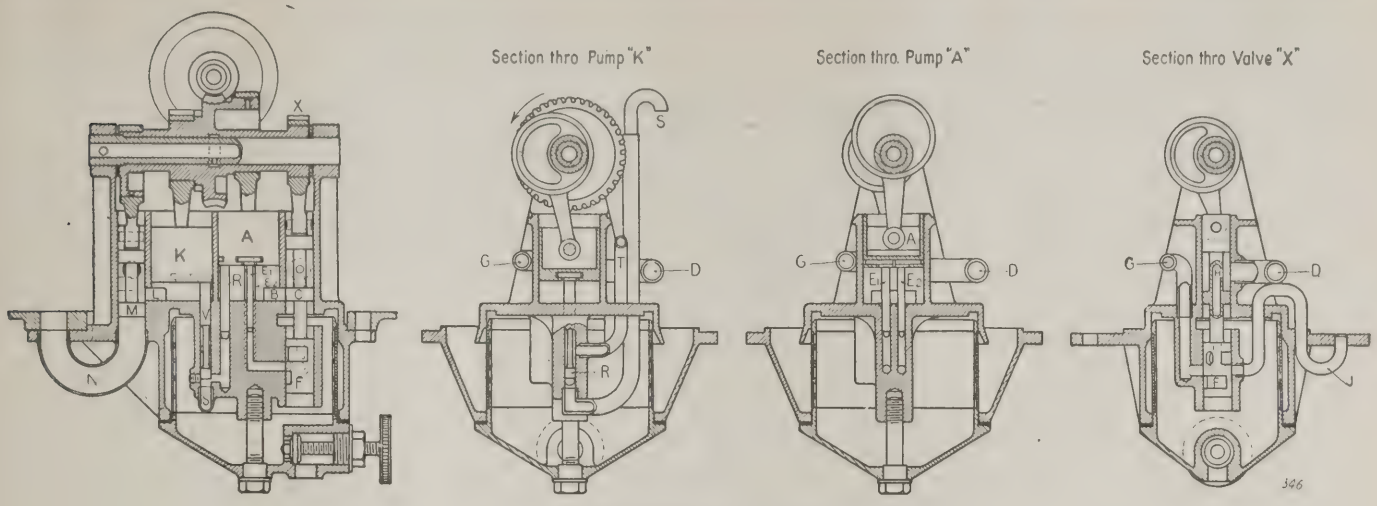


Fig. 16.
Water pump, with greaser and its actuating ratchet



General arrangement of oil pump.

at the largest diameter top and bottom. A barrel type of throttle valve is arranged, 80 mm. in diameter, and mounted on the ball bearings at each end. The races are 35 mm. diameter, and are located in recesses turned in the end covers of the gun-metal throttle valve liner, which is pressed into the cast aluminium body of the carbureter. The semi-elliptical ports in the throttle valve are 80 mm. long by 50 mm. wide at the bottom side and 80 mm. by 55 mm. at the top.

The pilot jet, which is the same length as the main jet, is .9 mm. bore at the orifice, and is situated at the side of the intake passage. It communicates with an annular groove machined around the outer end of the throttle valve liner in the body of the carburetor. From this annular channel a passage communicates with the induction pipe just above the throttle valve, which when closed draws air through a V slot cut in the barrel of the throttle.

A conical suction valve supplies extra air automatically at all speeds through eight holes, 14 mm. diameter, drilled in the annular seating which surrounds the base of the choke tube. The air to the carburetor, as already mentioned, is taken through the interior of the base chamber; the diameter of the air intake passage is 100 mm., and it extends inside the crank case to the centre of the engine.

The throttle valve is water jacketed by pipes leading from the main water circulation pipe to water spaces cast in the body of the carburetor around the throttle valve.

Induction Pipe

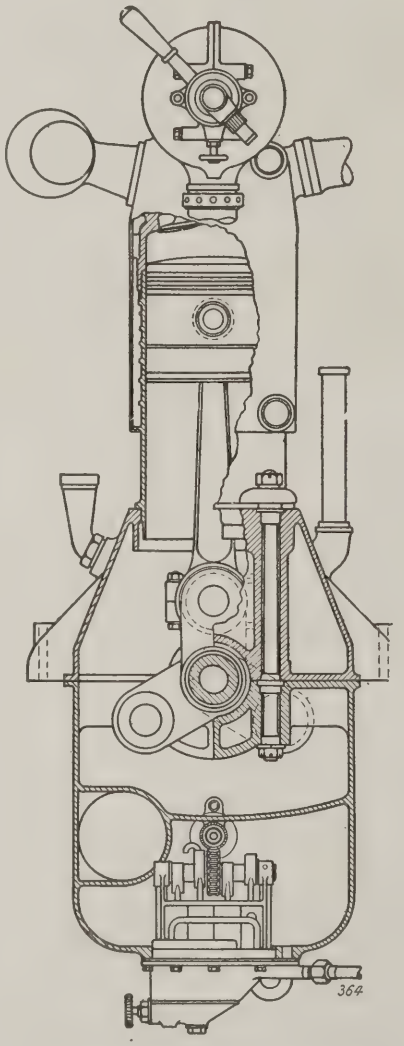
The diameter of the induction pipe at the joint where it meets carburetor is 70 mm., this diameter increasing to 100 mm. towards the engine, where it takes a right-angled bend. It is lagged with asbestos cord up to this point.

The design of the top portion of the induction pipe is interesting, the gas being led to the centre of the engine by the 100 mm. pipe, whence it enters two branches 70 mm. diameter, through a port 100 mm. diameter. The two branches lead outwards to the inlet ports, three, of course, on either side of the main entry. One-half of the branch is enclosed by the main induction pipe. The cylinder ports are 85 mm. long and 50 mm. wide.

Ignition

Two Bosch magnetos, type Z.H.6, are mounted transversely to the crankshaft upon a bracket at the rear end of the crank case, one being a starter magneto used in conjunction with a hand starter dynamo. The magnetos are driven by bevel gears directly off the vertical camshaft driving spindle, the direction of rotation of both being anti-clockwise. The arrangement of the magneto driving gear is shown in fig. 14.

All twelve sparking plugs are fitted on the inlet side of the engine, and are situated directly below the inlet valves, the high-tension wire being carried in two fibre tubes attached to the side of the cylinders on the inlet side.



Cross section through cylinder and crank case.

Air Pump

Fig. 15 shows details of the air pump, which is driven off the front end of the camshaft; the bore is 26 mm. and the stroke 27 mm. An adjusting screw is fitted above the release valve for regulating the strength of the spring, the released pressure being taken through the hollow stem of the adjusting screw. An oil trap is provided just below the pump to retain any surplus oil which may find its way past the air pump valve and into the pressure pipe.

An electrical tachometer is driven through a flexible driving cable at engine speed off the rear end of the camshaft.

Water Pump

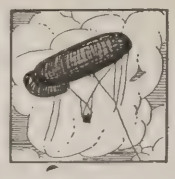
The water pump spindle is driven by a vertical shaft through a bevel gear on the end of the crankshaft, and in the same vertical axis as the camshaft driving spindle. The pump is attached by a flange to the bottom of the sump, next to the oil pump. Fig. 16 shows the constructional details of the pump, which is of the centrifugal type, the water entering below the bottom flanged cover through a 45 mm. diameter port below the rotor. The water is delivered centrifugally from the vanes between the top and bottom discs of the rotor, which is also fitted with vanes upon its top side to throw the water away from the spindle. No packing glands are provided for the driving spindle, but a hardened steel washer is set into a recess machined in the upper face of the rotor, and this is kept in uniform contact with the face of the phosphor bronze spindle bush by the action of a light spring that is fitted under a ball thrust race at the driving end of the spindle. The diameter of the outlet passages from the water pump to the cylinders is 45 mm. Double inlet water connections between each of the six cylinders supply the water jackets at the top and bottom, the diameter of the steel circulation pipes being 40 mm.

The foregoing notes will give a very fair idea of the layout and detail design of the engine. The figures, analyses of materials, are in process of preparation by the Naval and Military authorities, and we hope to include these further details in a near issue.

With regard to the actual detail construction of the 260 h.p. Mercédès engine, practically the only point of novelty is the scheme adopted on the built-up cylinder and head. It is difficult to arrange for valves per cylinder with satisfactory water spaces, and it should be noted that the valve arrangement on the Mercédès engine is particularly good in this respect, ample room for free water circulation being provided. The importance of this point becomes increasingly evident on an engine of the dimensions of the 260 h.p. Mercédès, not only on account of immediate cooling problems in running, but in the subsequent effect of such heat and the dangers of distortion in a cylinder of large size.

The details of the built-up cylinder and head are all different from any other engine that has at present emanated from Germany, and, occurring in an engine of the Mercédès manufacture, this departure is the more marked, because it is an entirely new scheme for this particular firm to adopt. The trend of design on the 260 h.p. Mercédès cylinders and heads is most markedly towards Maybach practice, and the inference to be drawn is that this particular system has proved itself eminently satisfactory in practice.

The 260 h.p. Mercédès, it must be admitted is a workmanlike and nicely completed job, homogeneous in its general layout, and mith many minor pleasing points for the scrutinizing designer.



MILITARY AEROSTATICS



Goodrich Blimps Pass Navy Test

The Navy Department announces on Sept. 22 its acceptance from the B. F. Goodrich Company of Akron, of the first of the two huge Blimp type non-rigid dirigible balloons which that corporation had been constructing under the personal direction of Henri Julliot, the noted French aeronautical engineer. In laconic form does Uncle Sam dismiss the scintillating romance that attached itself to the tests, to the very construction itself—how the dirigible roamed the heavens at night, brushing against vagarious clouds over an unsuspecting metropolis.

Up Eight Hours

For eight hours the dreadnaught of the air remained aloft, and all the time it hung over the great city "Somewhere in America." For eight hours the critics stood in the chill night air, sometimes conversing in low tones but for the most part remaining silent with eyes glued to the sky. A dramatic picture, indeed, was Julliot, the "Super Zeppelin of France," who maintains that his aerial experiments and successes antedate those of the late Count Zeppelin. The moonbeams caught him in restless pose, constantly pacing to and fro and stroking his imperial and breaking now and then into vivacious speech in French. Although most of the "lighter than air" craft now in use on the British and French coasts are the results of his handiwork, his eagerness to convince the American Government of his great ability was conspicuous. At length, when the naval officers had announced their recommendations, tears of joy streamed down his cheeks and his whole frame shook with emotion.

Knabenshue Pilots Car

Roy Knabenshue was the pilot. Promptly at a designated hour—for obvious reasons a night flight was more desirable to the Government than a day one—Knabenshue leaped nimbly into the gondola, buttoned up his leather coat and started the huge propeller. Mechanicians followed suit. A few minutes later the big machine rose gently and climbed into the night. The major portion of its twenty mile course lay over the city ablaze with light and a considerable part over a large body of water. Once beyond the lights of the city Knabenshue had only the stars and his instruments to guide him. With the precision of the taxi drivers underneath him, Knabenshue maintained the trial speeds successfully, making every turn in the air-course and finally wending his way to sea to a small tug which marked the point where the return voyage was to begin. So carefully had the motor and the big fins which steer the monster been tested that not a hazardous moment marred the flight. This marked the finish of the first flight which satisfied Navy Department officials and engineers that it was capable of making its required speed.

Balloon Pilots' Certificates

Spherical Balloon Pilot Certificates of the Aero Club of America have been granted, during the week of Sept. 10, to the following candidates: No. 114, Fred S. Dunn, Jr.; 108, W. W. Pemberton; 115, John Richardson; 116, L. D. Palmer; 117, Allan P. McFarland; 118, Joseph E. Kirkham; 119, Walter J. Reed; 120, Cyrus W. Merrell.

Military Aerostatics

It is well known that spherical balloons, such as are used in making test flights in training men to become pilots, cannot be steered, but must follow the direction of the prevailing air currents. All of which renders more remarkable the experience of Lieutenant Huff, in a flight from the Goodyear Tire & Rubber Company's aviation field near Akron, Ohio. The wind currents proved just right to carry him to the region of his home near the Ohio River, and, as his balloon had lost a considerable volume of gas in making several intermediate landings, it became necessary to make a final landing. Flying low, he passed over an automobile, the occupants of which he recognized as acquaintances, and a few minutes after hallooing to them, landed in the yard of his own home, 100 miles from the aviation field.

The Kite Balloon in Warfare

(*Continued from page 70*)

Another role of the kite balloon is observation from what may be called the strategic standpoint. In this case the observers are not in communication with a battery but make a careful survey of the country some distance behind the enemy's lines, noting the movements of trains and looking for concealed batteries or any other objects likely to prove interesting to the Divisional or Corps staff. For this work it is necessary that the observers should know the terrain absolutely intimately, so that the smallest alteration in any feature of the lanscape will be detected at once. This does not sound very difficult until one realizes the extraordinarily flattened aspect of the landscape. Anywhere in the neighborhood of the trenches there is practically nothing for the eye to fix upon as an aid to memory. Hence it is essential for the observer to train himself to such an extent that the smallest change in the apparently flat country will instantly attract his attention.

The same phenomenon enormously increases the difficulties of regulation of artillery fire. For a battery to engage a target successfully it must have some object on which to "lay" the gun. On a map of an ordinary civilized countryside there are innumerable prominent objects which can be fixed upon for this purpose. But in a landscape which has been devastated by two years of trench warfare a map is completely useless. There are no churches, no houses, no villages, no trees even, and consequently the direction of the target must be given by map square or cross compass bearings, the shots being gradually brought on to the target, first by correcting for "line" (so many degrees Right or Left), and later by correcting for range (so many yards Short or Over).

In addition to the above uses of the kite balloon it can also assist the aeroplane in Contact Patrol work. One of the chief difficulties of the staff in an attack is to know what is happening behind the veil of smoke into which the men disappear as soon as they leave the trenches. It is the duty of the observer to maintain a liaison betwen the battalion or company commander in the front line and the brigade and divisional headquarters at the back, either by observing the progress made or by the reception and transmission of visual signals. This particular sphere of usefulness includes the advising of the artillery as to the right moment to raise the covering barrage or put up a barrage against a projected enemy counter-attack.

Up to the present we have dealt only with the kite balloon on land, but it has equally valuable uses in conjunction with the Fleet, though less has transpired of what is being done in this direction owing to the secrecy in which all the doings of the Navy are shrouded. It is, however, sufficiently obvious that it can be used here again for spotting—in a Fleet action—as well as for scouting for the approach of hostile forces. The possibility of seeing down below the surface of the sea enables it to detect a submarine running submerged, while owing to the height of the point of observation above sea level a submarine's periscope would be distinguishable some considerable time before it became visible from the deck, or even the foretop, of a battleship. What use is being made of these powers we are not permitted to say, but we may perhaps be allowed to surmise that more than one enemy submarine has met its doom owing to the timely summoning of our destroyer patrols by kite balloon observers. Even supposing this were not the case, a submarine cruising on the look-out for a likely target would, one imagines, very quickly seek the depths, and so become innocuous, on becoming aware of watchful eyes in the air. It must not be forgotten that it was the R. N. A. S. who introduced the kite balloon to the British Services and who, in the Dardanelles, first flew one from the deck of a ship, and it is not to be supposed that they have been content to rest on their laurels and allow their discovery to become the monopoly of the Army.



The Goodrich Blimp Emerging from Its Hangar.

FOREIGN NEWS

BELGIUM

Sept. 17.—How Adjutant Maurice Medaets tricked a monster German two-man aeroplane into a fight at an altitude of 20,000 feet and sent it crashing to earth, killing the pilot and observer, was told in a message to the Belgian Legation at Washington, D. C.

Sept. 18.—In the recent raid by entente allied airmen on the Belgian town of Roulers, says the Courier de la Meuse, a newspaper of Maastricht, Holland, a bomb fell on a building near the market and killed or wounded 900 Germans.

FRANCE

Paris, Sept. 19.—Reports from the front say that members of the Lafayette Escadrille are again very active in patrol work. German aircraft were found over the French lines last Sunday in great strength, but were driven off by the American flyers after many desperate fights. No losses were experienced by the Lafayette Escadrille. The German machines were riddled and badly damaged. Sergt. Andrews Campbell of Chicago came down with his machine full of bullet holes.

Two more members of the escadrille have been cited in French Army orders. They are Sergt. Walter Lovell of Concord, Mass., and Sergt. Harold Buckley Willis of Boston. Lovell is one of the most recent members, having been transferred from the field ambulance to the aviation service last February. He has shot down two Germans. His citation reads:

"Walter Lovell, American citizen engaged in the service of France. An excellent chasing pilot full of presence of mind and courage. During an operation protecting a bombarding squadrilla on Aug. 18 shot down an enemy machine, which crashed to earth in flames."

Willis is another young member of the escadrille, having joined this year. He was brought down behind the German lines while also protecting a bombarding squadrilla. News of his capture and imprisonment has already been cabled, but he is reported to be in good health. His citation reads:

"Harold Buckley Willis, American citizen engaged in the service of France. A veritable model for his comrades by his courage and high conception of duty, he has furnished by his reconnoitering much and useful information. Fell Aug. 18 during an engagement against two enemy aeroplanes which attempted an attack, bombarding aeroplanes which he was escorting."

American Field Headquarters in France, Sept. 21.—Members of an American regiment of engineers that has taken over some miles of French military railway had a close escape one night this week when a squadron of German aeroplanes pursued a train in which they were riding, dropping bombs each time the firebox was opened.

The Americans finally stopped the train and managed to take refuge beneath the locomotive.

The Germans shortly afterward departed. There were no casualties.

Paris, Sept. 21.—Pilot Walter S. Rheno, of Boston, a member of the Lafayette Flying Squadron, has been granted a second palm to his war cross for bringing down his second German aeroplane single handed.

GERMANY

Berlin, Sept. 19 (via Amsterdam).—French aerial squadrons on Sept. 16 bombarded several German cities in Wurtemberg, Rhenish Prussia and upper Alsace, according to an official statement issued to-day by the German War Office. The announcement says that near Stuttgart one soldier was slightly wounded. At Freudenstadt and at Colmar damage was done to buildings. All the other attacks caused neither losses in killed or wounded nor material damage. Three enemy aeroplanes were shot down on German soil.

(An official statement issued by the French War Office Monday night said that numerous raids were carried out on Sunday by French machines, which dropped 15,000 kilos of projectiles on German establishments. These included the barracks and factories at Stuttgart, an aviation camp at Colmar, depots at Elbach, military establishments south of Metz, the railway station at Thionville, factories at Tuebingen, and the Saarbruecken station.)

Front of the German Crown Prince, Sept. 20.—Twenty aeroplanes were shot down by Germans on this front.

A report dated Sept. 23 says:

"The enemy lost fourteen aeroplanes yesterday and one captive balloon. Sergeant Thom again brought down two aviators."

GREAT BRITAIN

British naval seaplanes on Sept. 15 dropped bombs on German destroyers and trawlers along the Belgian coast between Ostend and Blankenberghe, near Zeebrugge, hitting one destroyer and sinking at least one trawler. An official statement issued by the Admiralty also says:

"In the evening, during a late patrol, one of our seaplanes was attacked by two seaplanes, which were engaged by our escorting aeroplanes, and one was shot down in flames, the other being chased towards some enemy destroyers.

"About 10 A. M. Sept. 16 our patrol engaged a formation of enemy aircraft, destroying one and probably two."

With the British armies in France and Belgium.—One of the spectacular air incidents occurred Sept. 16 when a British aeroplane dispersed 2,000 enemy infantry by turning its machine gun on the men along one of the highways.

A British report dated Sept. 20 says:

"The enemy aircraft on Wednesday took advantage of the exceptionally strong west wind to make repeated attacks upon our artillery, the machines turning east at once when approached by our scouts. Nevertheless, considerable artillery work was done with our aeroplane observations, and many photographs were taken.

"Parties of hostile troops and transport were engaged by machine gun fire during the day, and over one and a half tons of bombs were dropped on various targets. Another ton of bombs was dropped during the night on the enemy's billets and hutments, in spite of most unfavorable weather.

"Six German machine guns were brought down in the fighting and four were driven down out of control. Seven of ours are missing."

London, Sept. 22.—The following official statement dealing with the activities of the British aviation corps during the British offensive in Flanders was issued by the War Office:

During the first two hours of our attack on Thursday low clouds and a drizzling rain made flying almost impossible. However, our aeroplanes flew out at low altitude and dropped bombs on a hostile airdrome near Courtrai, besides firing at bodies of German infantry. As soon as the weather slightly improved our aerial activity became great and contact was kept with our advancing troops, and both aeroplanes and balloons gave observation for our artillery. On several occasions the location of enemy troops preparing for a counter attack was reported to our artillery, who successfully dealt with the situation.

While the attack was in progress aeroplanes fired from their machine guns over 28,000 rounds, from heights ranging between 100 and 1,000 feet, at German infantry in their trenches and shell holes, at reinforcements coming up to the battle, at bodies of troops on roads and working behind the lines, and at hostile batteries, machine guns and transports. During the day sixty-eight bombs were dropped on the Ledgehem railway station, ninety-six on two airdromes northeast of Lille, and 103 on billets and ammunition dumps in the battle area. At night, in spite of the most unfavorable weather, bombs were dropped on two towns, on the Ledgehem-Roulers and Menin railway stations.

In the middle of the day the German aircraft became very active, attempting to interfere with our artillery and our bombing and low flying machines. In the evening when the weather improved they kept well to the east of the lines and were not inclined to fight. Ten hostile machines were destroyed and six were driven down out of control. Ten of our machines are missing.

London, Sept. 22.—From London to York by aeroplane in one day. This is the scheme of J. A. Whitehead, Governing Director of Whitehead Aircraft Ltd., and he told a *Daily Sketch* reporter that it is to be carried to a successful conclusion.

"When our plants are full matured." he said "we shall make a trip which will be the most sensational in the whole history of aviation. The aeroplane will be piloted by Herbert Sykes who anticipates leaving Hanworth Park, Feltham Middlesex, at dawn and reaching York before night. The trip will be accomplished on a specially designed very powerful Whitehead machine which is being built at our Middlesex factory. Edgar Middleton will accompany Mr. Sykes as navigator. He has served in an Essex Regiment and was Sub-lieutenant. Both are immensely enthusiastic and confident.

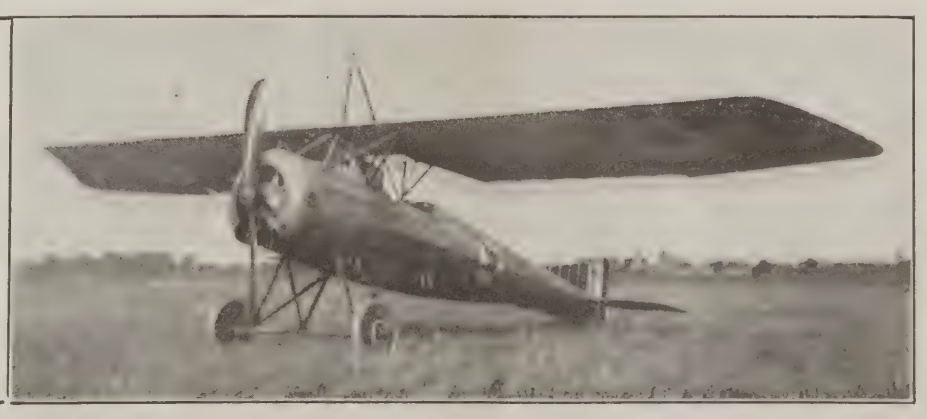
London, Sept. 23.—American airmen in England are dubious about the success of J. A. Whitehead's scheme for crossing the Atlantic by aeroplane from east to west in one day. An American officer pointed out to a Daily News representative the difficulties in the way at this time of year when equinoctional gales are due.

"The prevailing Atlantic winds," he said, "are from our side to yours, and experiments to be successful need a most favorable condition. A worse period for crossing to America from Europe could not be chosen than that between now and the end of next March. I see it is announced that the flight will occupy about twelve hours, which means 250 miles an hour in the teeth of the wind. Just look at the proposition."

RUSSIA

Petrograd, Sept. 20.—Russian airmen successfully bombed enemy depots in the region of Podrazyn, on the north shore of Lake Narocz. Enemy airmen dropped bombs in the neighborhood of the railway stations at Dubno and Radzivilov.

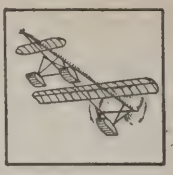
The French Morane-Saulnier "Parosol" monoplane. These machines are still in use on the battle fronts, and aside from the monocoque body, differ very slightly from the earlier models





MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th St., New York City
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
LONG ISLAND MODEL AERO CLUB
401 Grant Ave., Cypress Hills, L. I.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

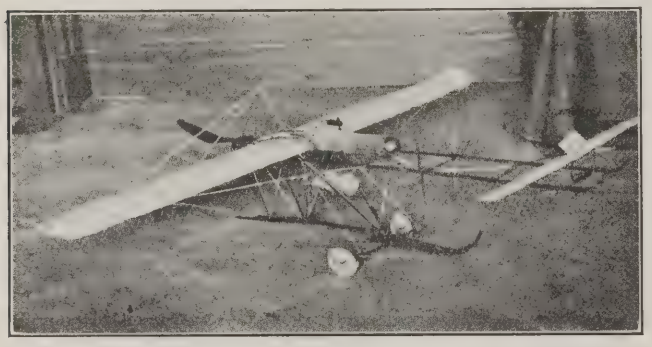
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Some Remarks on Steam Plants for Model Aeroplanes

By V. E. Johnson, M.A.

A successful steam plant for model aeroplanes must possess, among other things, great lightness, reliability, simplicity, quickness in starting, a high factor of safety, be easy of control and suitable also to some form of automatic control. The only type of boiler which satisfies such conditions is of a tubular form.

Now this can be made in two distinct forms, the water tube and the fire tube. In the first-named the water passes through the tubes which are surrounded by the products of combustion —while in the second it is the products of combustion that



English model monoplane driven by a steam power plant

pass through tubes surrounded by water. Of the two, the former is to be preferred, owing to its small weight and the ready response which it can be made to give automatically to the demands of the engines—largely due to the very small amount of water in the boiler at any one time. Actual practice in the case of automobile cars has shown that these tubes may be placed in any position—vertical, horizontal, or inclined, or in a spiral or coil form. There is in such a type no necessity to trouble about water circulation, as in the ordinary types of boilers, on account of the infinitesimally small time that it remains in the boiler before it is turned into steam. Such a type of boiler is especially *safe*—even if a tube should burst or split, the escape of steam and water would have, practically speaking, no harmful effect even in the case of an automobile flash boiler, let alone one fitted on to a small model aeroplane.

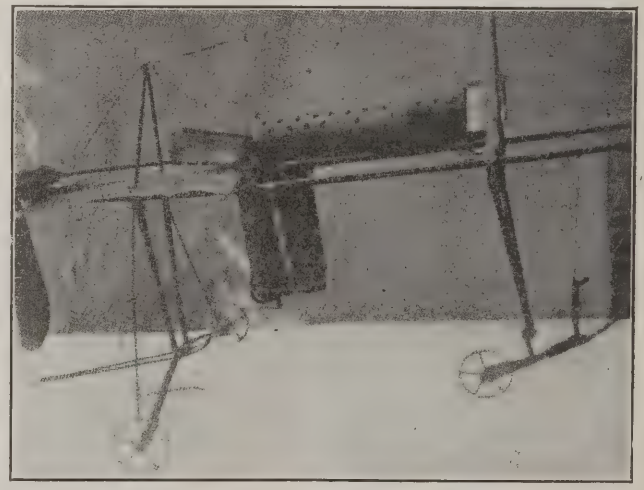
A well-known engineer once stated that he was quite prepared to sit on the top of such a boiler while it was being forced to the greatest possible extent—so small did he consider the risk to be. In the flash boiler the water is more or less instantaneously converted into steam by contact with very hot metallic surfaces, the temperature of such surfaces being considerably above that of the steam as first formed. The general direction of the steam and the water through the generator should be the same as the products of combustion, so that the more or less cold water enters the boiler where the temperature is lowest, thereby first coming in contact with the cooler gases, and having its temperature continually raised as it passes through the coils, such an arrangement greatly contributing to the efficiency of heat conversion. Finally, the steam, now superheated, leaves the boiler on its way to the engine. It is well known that when steam is heated in contact with water, *i. e.*, in the steam space of a boiler, its pressure increases with the temperature, and more of the water is evaporated; when, however, steam is heated (so to speak) after having left the boiler and on its way to the engine, its pressure remains the same, but its volume increases. This extra volume passing into the steam cylinder and thus reducing the quantity of steam taken from the boiler. In the early days of superheating, when only animal and vegetable lubricants were used, the rapid deterioration of valve faces, etc., exposed to friction under steam pressure, was so great as soon to lead to the abandonment of such a system, but with the improved lubricants and metallic packings now available these objections no longer hold, especially so in such a case as we are considering, which is only required to run for a short time each trial. Also, to get good results out of high-pressure steam, we must have an engine with high temperature cylinders; strictly speaking, we should also have one or more intermediate cylinders and a low temperature part, *i. e.*, the condenser; these latter, however, in the case under consideration, have to be omitted owing to the extra weight they would entail.

The simplicity of such a system is further enhanced by the fact that there is no water level to maintain, and therefore no need of any water gauge or fusible plug, and the consequences of a split tube is no more serious than the opening of a safety valve.

The writer has frequently tested such boilers by making them red hot, in some cases almost white hot, and allowing water under pressure to enter them while in this condition without any damage resulting.

Another advantage arising from such a type of boiler is that no trouble is experienced from the presence in the water supply of such substances as lime, oil, chalk, dirt, etc., owing to the high momentum of the steam being quite sufficient to carry such through in suspension. To get good results a thoroughly efficient mixing of the air and gas or vapor (in this case benzoline) is absolutely necessary. Another very important point is that a fine and accurate control must be effected on both the supply of fuel to the burners and of water to the boiler.

(*To be continued*)



Type of flash boiler used in English models. Designed by H. H. Groves



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

"Perhaps"

Can aeroplanes e'er reach the sky?
Perhaps.
And is it really very high?
Perhaps.
If, when the 'bus is like a lamb,
It hits a "pocket" with a slam,
Then does the aeronaut say "Dash"?
Perhaps!

Is dying really awful fun?
Perhaps.
Isn't it rather overdone?
Perhaps.
But, hang it all, it's rather rash;
And yet—what fun to have a smash,
To come a really juicy "crash"—
Per—haps!

E. W. Scott.

The Birdman's Call

By Berton Bellis.

Unbridle our mills with tools of steel!
Master this fiend—speed up the wheel!
Fly over this land and fight for peace!
Just cut loose—all Hell—so he will cease.
Millions call in grief from across the sea—
Who are slaves, calling to be free.
The boys of our nation are aching to fight,
Will give their all and flight for flight.

Strike from the heavens—make autocracy respect love!
Strike at his heart—from the air above!
Speed up the mills and give him pain!
Conquer this reptile with the airplane—
Drive the viper submarine from the sea!
Unchain the hands of our liberty!

Mothers, fathers, sisters, children and wives,
Countless innocent souls have lost their lives,
From the hands of the demon with a putrid mind—
Whose sight for all good has gone stone blind.
For the stars and stripes forever must fly!
Let "Old Glory" thunder from the sky!
As all humanity calls for us to fight,
For our God—our country—truth and might.

"Who are our rear guard?" asked the commanding general as the retreat was assuming the proportions of a rout.

"Those who have the worst planes, sir," replied the aid, without the slightest hesitation.—*The Lamb.*

The "Jim Crow" law operates in the South to keep black people from riding in public vehicles with white people—the need to apply the law to aerial travel has not presented itself yet.

Neither pigeon toes nor flat feet prevent a person from learning to fly—and a cure is being tested for cold feet.

While rushing the erection of our plane to meet an engagement, our valued scarf pin was caught on a wire drawn out and eluded our search in the grass. We were bemoaning our loss when an agricultural onlooker remarked: "It's a pity you all lost yer pin, caise thur aint no five cent store in this town."

A group of automobile enthusiasts were bragging about the Indiana roads one day at dinner in an Indianapolis hotel, when a quiet stranger remarked, "Gentlemen, I can drive my machine over any road in Illinois at 60 m. p. h."

A riot was averted by a bejeweled jew rushing up to the stranger, exclaiming: "Come on Alex, you fly in fifteen minutes."

If La Follette worked as hard for the U. S. as he has recently done for his friend the Kaiser, he would expect the salary of a president.

If results are disappointing we suggest that he buy a quantity of toy soldiers, toy cannons, toy submarines and one toy Lusitania to relieve the monotony of life in St. Helena.

Colonel Roosevelt applies the name "Copperhead" to certain influential persons who are biting Uncle Sam's hand while he feeds them; we always thought the Colonel was too good a naturalist to malign a snake which cannot practice duplicity.

Contemplating the news of the $640,000,000 aernoautical appropriation must make Henry Woodhouse feel like David when Goliath fell.

If you are a real aviator and wish to place your services at the disposal of the Government, be sure that the officer in charge likes the way you part your hair.

A. C. Beech.



"Funny them German Anti-aircrafts don't never 'it nothink more oftener!" "Yes!"

J. ROBINSON HALL

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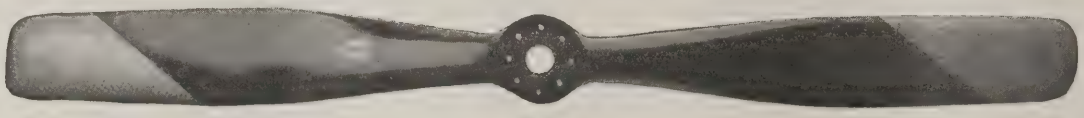
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Announcement to Aircraft Manufacturers

The Delaware Aeronautical Company is in reality a college endowed by the Messrs. du Pont of Wilmington, Del., for the purpose of training students in the art of aircraft manipulation, design, construction and theory. No charge whatsoever is made to the students, and even their board and lodging is furnished them by the Company during their course of training.

The Management of the Company would like to be informed by Aircraft Manufacturers of any positions available for the students who graduate from the school. While they are all training for the purpose of assisting the Government in any crisis which may arise, nevertheless it is possible that this necessity may not come up, and in the meantime they should be a very valuable asset to any aeronautic commercial organization.

We invite correspondence concerning this matter, and will gladly furnish names and addresses of such students as we may believe to be particularly qualified for any special line of work.

DELAWARE AERONAUTICAL COMPANY

HARRY N. ATWOOD, *General Manager* WILMINGTON, DELAWARE

The Lawson Primary Tractor

(*Continued from page* 108)

ground. The main V chassis members are streamlined spruce. Lower ends are spaced by a pair of steel tubes, placed at either side of the axle, with heavy cross bracing cables attached to their ends.

The forward wheel is held in place by a pair of steel tubes from the main spacing tubes, and by a pair of spruce-faired steel struts from the fuselage. Its axle is immovable. The struts are bound and wrapped with fabric.

The tail skid is of ash on a universal joint supported by three steel tube members from the body. Rattan wing skids are placed under outer wing struts.

Tail Group

The framing of the tail works is of steel tube with spruce ribs and braces attached by means of light sheet metal straps welded to the tube.

Overall dimensions of the stabilizer, 3'-3" by 11'-0". It is non-lifting and rests on the upper longerons, braced by a pair of steel wires above and below, at either side of the fin.

Flaps or elevators are 2'-5" wide. Outer tips are 12'-3" apart. Each flap is attached to the stabilizer by three hinges.

The fin is curved and recessed to take the balancing section of the rudder. The rudder post is 4'-0" long from the bottom of fuselage, and the rudder reaches a maximum height of 5 inches above the post.

Motor

The motor is a Hall-Scott A-7a of 100 horsepower. It drives a metal tipped walnut propeller 8'-0" in diameter, with a 5'-8" pitch at 1400 r.p.m. The bore of the motor is 5¼" and the stroke 7 inches. Weight complete, without propeller, 410 lbs.

The consumption of fuel is at the rate of 8.5 gallons an hour and oil at 0.5 gallons an hour. The tanks hold 175 lbs. of gasoline and 25 lbs. of lubricating oil.

In figuring the useful load, the items and weights considered are as follows: pilot and passenger, 350 lbs.; Fuel, 200 lbs. and accessories, 50 lbs. Total 600 lbs., which makes the loading per horsepower 19 pounds.

Popular Books on Aeronautics

Textbook of Naval Aeronautics, to Teach Airmen to Fight the Enemy Under, On and Over the Sea, by Henry Woodhouse, with Chapters by Rear Admiral Fiske, Rear Admiral Peary, Elmer A. Sperry, and other authorities	$6.00
Dyke's Auto and Gas Engine Encyclopedia, 1918	3.00
Aeroplane Designing for Amateurs, by Lougheed	1.00
Radiodynamics, by B. F. Meissner	2.00
The Properties of Aerofoils and Aerodynamic Bodies, by A. W. Judge	6.00
Aeronautical Engines, Kean	2.00
Military Sketching and Map Reading, Barnes	.75
Aviation Pocket Book, 1917, Matthews	1.50

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In an appreciative foreword, Rear Admiral Bradley A. Fiske describes the book as "clear, correct, and stimulating."

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AERIAL AGE WEEKLY

Vol. 6, No. 4 OCTOBER 8, 1917 10 CENTS A COPY



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AERIAL AGE WEEKLY

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THE TRADE AUTHORITY

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TRANS - ATLANTIC FLIGHT ASSURED FOR NEAR FUTURE

THROUGH a campaign conducted by the New York Herald, which had been advised from Europe that Italian aviators are ready to make the flight across the Atlantic provided the United States Government or the Aero Club of America arrange for the flight, there has been brought out the fact that everything is ready for the demonstration repeatedly urged by AERIAL AGE, that the difficult problem of delivering a large number of machines for the air drive on German military and naval bases could be solved by flying the machines to Europe. The great Italian Caproni triplane probably will make the flight early next spring.

American manufacturers stand ready to make 1,000 battleplanes that will cross the Atlantic and then destroy the German fleet at Kiel before they have to be overhauled.

The demonstration of the Caproni triplane in this country, with the discovery by American scientists of a method of telling aerial direction by radio waves, makes the smashing of the Kaiser's navy possible and probable.

Those developments in the science of aerial navigation also guarantee to the Allies an endless stream of American battleplanes to wreck the German artillery, blow up their munition depots, demoralize their transportation lines which feed the front and destroy their reserve bases.

The Allies have said they could win the war quickly if they could have limitless battleplanes. Getting the machines from the United States to France and England has been the obstacle to overcome.

Experts Support Programme

Investigation shows that the aerial navigation of the Atlantic is now possible, a statement supported by Major Perfetti, head of the Special Italian Commission for Aeronautics in the United States; by Rodman Wanamaker, builder of the great America triplane now in service of the Allies; Alan R. Hawley, president of the Aero Club of America, and with Mr. Wanamaker, leader in solving the transatlantic aerial transportation problem; by Glenn H. Curtiss and other American inventors and manufacturers, and by numerous English, French and Italian aviation experts.

The Italian commission and the Aero Club of America under Mr. Hawley already have worked out details of crossing the ocean by aeroplane, and Mr. Hawley has gone so far that route for a modern armada of battleplanes has been established, with a time schedule that includes a bomb dropping expedition above the German naval base.

In the meantime the United States Aircraft Production Board, of which Howard Coffin is the head, is making hydroaeroplanes of great size, and in Washington it is confidently expected that among the first machines to be started for Europe some will try to make the transatlantic flight instead of going on the deck of a steamship.

Details Are Withheld

The government Board is giving no hint of its intentions. Army and navy aviators and aerial scientists are working on the problems to be met and overcome, and it may be said that they are confident of success.

Therefore, the crossing of the Atlantic in the air, and the crushing of German military and naval power by an endless stream of battleplanes, now seems to be a race with the Aircraft Production Board, the Aero Club of America and the Italian Commission as to the contestants.

Among those authorities in the matter who were interviewed not one expressed any doubt that the crossing of the ocean would be accomplished soon. With all of them it was merely a question now of who would lead the way. Then will follow the hundreds, and thousands of aeroplanes necessary for the democratization of the world.

Mr. Hawley Tells of Work

Mr. Hawley tells of the future, the work that has been done and the methods employed to solve the oceanic aerial voyage in the October issue of Flying, in which he writes:

"The Atlantic is to be crossed in the air within a few months and the difficult problem of delivering to Europe the aeroplanes needed for striking Germany through the air will be solved thereby. And with that flight will start the era of commercial aerial transportation. All the factors necessary for crossing the Atlantic by aeroplane are available. There only remains to try the first flight.

"The most difficult problem in the cross-Atlantic flight has always been considered the problem of finding one's way during the flight. The distance between Newfoundland and the Azores is less than 1,200 miles, and those who have given thorough consideration to the subject have had little doubt for the last seven years that an aeroplane could be built to cover the 1,200 miles. But we appreciated the danger involved in the pilot losing his way, drifting from his course and missing the Azores.

"To solve this very difficult problem a number of authorities set to work to evolve tables of navigation and instruments to assist in the navigation. A lot of important pioneer work and research was done and valuable results were attained. For instance, at the request of Mr. Henry A. Wise Wood, the United States Naval Observatory prepared a valuable table of 'dip and refraction for aerial navigation.' Messrs. Elmer A. Sperry, Professor Charles L. Poor, Rear Admiral Bradley A. Fiske, U. S. N., retired; Rear Admiral Robert E. Peary, U. S. N., retired; Glenn H. Curtiss, Henry Woodhouse, Rodman Wanamaker, Professor John A. Brashear and J. Fred Haworth and other prominent scientists and aeronautic experts have defined the problems and have been at work developing special instruments to solve the most difficult of them.

Solution Found By Accident

"The practical solution of the problem of directing the aviators in a transatlantic flight was found by accident in 1914. Soon after the declaration of war the Aero Club of America—the headquarters of the national defence movement—was notified that 'the sky over New York was full of radio code messages,' presumably sent by German agents. In considering what could be done to assist the government in finding the source from which these radio code messages were sent it was found that the Allies were using special 'radio direction finders' which were installed on board ships and permitted the ships to find the direction from which radio messages were sent at sea. Reports were also received stating that the Germans were using such devices for the Zeppelins to find their way over London on very dark nights.

"Investigation proved that radio direction finders were being used and that the nature of those instruments permitted applying them for aerial navigation purposes.

"With the development that has taken place in perfecting radio direction finders it would be possible to equip a trans-Atlantic flyer with such a device, which would always point to the direction of a sending station, so that if any station was established at the Azores the aviators would have no trouble in finding the Azores and all possibility of losing himself would be precluded."

"We have been assured that an instrument can be obtained

weighing less than one hundred pounds and having a radius of close to 1,500 miles. For a flight across the Atlantic this instrument would be tuned with the sending station at the Azores and then with the instrument on the Irish coast, and the aeroplane crew would not have to worry regarding the possibility of drifting and missing the Azores and Ireland. The instrument being tuned to the sending station, the operator would recognize 'interferences' caused by radio messages being sent from ship or other stations, and would have no way of being put off his course by them.

"We have discussed at length with Major Perfetti, head of the Special Italian Mission for Aeronautics in the United States, his plans for the transatlantic flight, every detail of whch has been worked out carefully. Having considered a great many such plans in the last ten years, we are thoroughly familiar with the problems and difficulties attending such a flight—and are convinced that it can be done and done well. The largest Italian Caproni triplane can make the transatlantic flight easily, and, as Major Perfetti has stated, the Caproni Company will be glad to undertake it if arrangements are made for the flight.

"Italy built these huge Caproni machines for her operations against the Austrians over the mountains and the Adriatic Sea. They have all the requirements necessary for major operations against the German U-boat and military bases. If duplicated a thousandfold and flown from America to Great Britain, their next flight would be from Great Britain to Kiel, Wilhelmshaven and other German bases.

"Mr. Glenn H. Curtiss has also designed an aeroplane suitable for the transatlantic flight. The Gallaudet Company, in this country, and the Handley-Page Company, in Great Britain, are also ready to produce a transatlantic flyer. Everything seems to be ready, in fact, for the solution of this problem of delivering to Great Britain the warplanes necessary to conduct the aerial operations against the German U-boat and military bases.

Life of 150 Hours

"The life of large machines like the Caproni and the Handley-Page has been estimated at a minimum of 150 hours in the air, after which they must be overhauled. The flight across the Atlantic, together with the preliminary flights, would take about forty hours of the aeroplane's life. That would leave 110 hours with which to conduct major operations against the German bases. And the distance between Great Britain and Kiel, where the German fleet is is about 425 miles, and as these giant aeroplanes go at a speed of about ninety miles an hour, there would be an expenditure of about ten hours of flight in each raid. Therefore the aeroplanes would last throughout the flight across the Atlantic and for eleven raids—unless brought down by the enemy.

"Supposing that the delivery of one thousand warplanes across the Atlantic there should be a ten per cent. loss of aeroplanes landing in the water; this loss would be insignificant; the crews would undoubtedly be saved by the destroyers patrolling the route, and the motors probably could be saved. But the Allies would get nine hundred machines with which to conduct major aerial operations against the German bases, which they have not been able to conduct heretofore because of lack of sufficient number of warplanes."

SECOND PAN-AMERICAN AERO SHOW PROMISES TO BE ANOTHER IMPORTANT NATIONAL EVENT

THE second Pan-American aeronautic exposition is to be held at the Grand Central Palace from February 16 to 23. It again may prove to be instrumental in starting a new epoch in American aeronautics, like the first exposition, but on a much more extended scale.

Now, like last year, we need:

First—Public interest in aeronautics to get the support and men needed to build our aerial forces. But this need is much more urgent. Tens of thousands of American lives depend upon it.

Second—That interchange of ideas between aeronautic engineers, manufacturers and inventors and the encouragement and inspiration which they can get through contact with public enthusiasm.

Third—Developing new fields for the use of aeroplanes. The army and navy at present are not using more than half of the aeronautic manufacturing facilities available. The rest of the aeronautic manufacturers must either find new markets or go out of business.

To permit the latter would be to permit the destroying of possible sources of supply and trained men that may be needed badly a few months hence. These possible sources of supplies can be developed and these manufacturers kept busy if their aeroplanes were used for commercial purposes and by patriotic men who are willing to pay the expense of training themselves and others to be available to the government in an emergency.

Many young men of from seventeen to twenty and men from thirty to to forty-five years of age, below and above draft age, might thus train themselves and others, and in case of an emergency the government again would find reserve of half trained men to draw from, as it found upon the entrance of the United States into the war.

For Commercial Purposes

By making it possible for the manufacturers who are idle to undertake to supply aeroplanes for mail and express carrying and similar commercial purposes the nation will obtain a reserve of manufacturing facilities and trained personnel for the air services.

Fourth—A series of conferences on the possibility of using aeroplanes for commercial purposes will be held during the exposition. The chief of these will be a conference at which representatives of the Mayors and chambers of commerce of all the cities touched by the Woodrow Wilson Aerial Highway will be present, and at which will be discussed the programme for the establishing of aeroplane landing place at every fifty miles or so along the aerial highway. A modus operandi will be decided upon which will make it possible to establish several permanent air lines by next summer, which will permit the employment of the facilities which the army and the navy are not able to use at present.

There is no doubt that manufacturers are more apt to concentrate their efforts on bettering aircraft, increasing production and employing machinery which will cut down the cost of production if they can see the possibility of a permanent demand for aircraft after the war. Therefore the conferences to be held during the show will have as their principal aim the demonstration of the great possibilities for the use of aircraft for commercial purposes.

Interesting Accessory Exhibits

Fifth—The exhibits of accessories, aeroplane and motor parts and the machinery used for manufacturing them will be particularly interesting to the public and extremely valuable to the manufacturers, who have been so busy that they have not had the opportunity of looking for machines intended to speed up and cut down the cost of production. Speed in production means speed in breaking Germany's power. Cutting down the cost of production means saving to the nation, since orders are placed by the government on cost basis.

Sixth—Arrangements will be made to establish army and navy recruiting bureaus and to give plenty of publicity to the fact that the bureaus are there, so as to get thousands of men to enlist in the air service.

A few days ago it was announced that the Signal Corps is perplexed by the fact that the enlistments are only a fraction of the actual need and that it is expected they will have to resort to the draft to get the personnel needed. But, as the draft only takes men of from twenty-one years of age up, whereas the best aviators at the front at present are young men of between nineteen and twenty-one, the draft cannot get these young men.

Help for the Red Cross

Seventh—The Red Cross will be given every facility for raising funds during the exposition. There are a great many wealthy people in the membership of the Aero Club of America and its affiliated aero clubs and co-operating organizations, and their liberal contributions in the past give promise of substantial contributions at the Red Cross booth during the Aero Show.

Eighth—Every facility will also be given to the Secretary of the United States Treasury for the advertising and disposing of Liberty Bonds. By February it may be the intention of the Treasury to have another bond issue or to advertise another.

Ninth—At the time when President Wilson requested that there be no cessation in holding conventions and expositions the governments of the Pan-American republics were invited to participate in the second Pan-American Aeronautic Exposition. In every case the answer has been a hearty expression of co-operation, and it is assured that the governments will send representatives to the coming exposition. Mr. John Barrett, director of the Pan-American Union, also has approved the idea.

Tenth—Additional appropriations will be needed by next February for military aeronautics. The show will greatly assist in creating that public interest which is necessary to move Congress into action.



THE NEWS OF THE WEEK



President Wilson Signs Aviation Board Bill

Washington.—The Senate adopted September 26 without a dissenting vote, the Sheppard-Hulbert bill, as amended by the House, providing for an Aviation Aircraft Production Board of nine members. The personnel of the board will be three naval and three army experts and three civilians, all to be appointed by the President.

One of the three naval members shall be the Chief of Naval Construction of the navy, and one of the army members the Chief Signal officer.

Under the terms of the measure the Aircraft Production Board, heretofore an executive creation by designation of the President as a part of the war machine, receives the sanction of Congress. It is set forth in the enactment that one of the three naval officers shall be the chief naval constructor of the navy and one of the three army officers shall be the chief signal officer of that service.

A step in the speeding up programme was taken in calling a meeting of representatives of all the interests of aeroplanes called for. The purpose is to place definitely into effect the series of standards for aeroplane parts which the board has worked out.

President Wilson signed the bill on October 1.

American Flier Killed in France

The death of Douglas MacMonagle, of San Francisco, a member of the Lafayette Squadron, occurred during a patrol flight with two other Americans, Lieutenant Lufbery and Sergeant Rockwell on September 23. They were attacked by eight German machines, believed to belong to the combination known as the "tango circus." Apparently MacMonagle was taken by surprise. He fell within the French lines.

Sergeant Rockwell went to the rescue, but was too late to save his comrade. After a short flight, however, he downed one German, who fell crashing into a wood.

Army Flier Falls Into Sea

Venice, Cal.—W. H. Boulun, an army aviator, who enlisted at Fairfield, O., and Robert H. Bailey, a passenger, had a narrow escape on September 26 when the engine of their aeroplane failed and Boulun was forced to descend into the ocean. The descending plane grazed an amusement pier on which Boulun's mother stood screaming.

Both men swam and waded ashore. Boulun was cut about the face and was taken to a hospital.



The twin Ford-motored hydroaeroplane described on page 154

Curtiss Gets War Contract

Buffalo.—The Curtiss Aeroplane & Motor Corp. has closed with the Government for war contracts, thus putting all of its plants in this ciy at capacity work until the termination of the war.

Nov. 15 was the date upon which the big new plant here was to be completed for full operations. It is now stated that the company will be in a position to go ahead with the production of aeroplanes in most of this plant considerably in advance of that date, at least by Nov. 1, and perhaps by the middle of October.

Curtiss has already paid out more than $1,000,000 on building contracts aggregating about $4,000,000. Its new plant has been financed and its full requirements for working capital are provided.

It is understood that the original order for 4,500 Curtiss engines placed with the Willys-Overland Co. early in the summer is now in production and has been increased.

Although the size of the Government order for aeroplanes is not known, it is stated that things have been satisfactorily arranged for the Curtiss Company, notwithstanding the vigorous pressure of claims upon the Administration for the location of plants for the production of aeroplanes in other parts of the country.—*The Automobile.*

Miss Ruth Law Sets New Height Record

Peoria, Ill.—Miss Ruth Law set a new altitude record for women at the Implement Show grounds, Sepember 28, when she went up in her Curtiss aeroplane 14,700 feet. The previous record of 12,800 feet was held by Miss Ruth Law.

American Surgeon Hit in Air Raid in France

Washington.—The slight wounding of First Lieut. Howard F. Keating, of Philadelphia, Medical corps, during an air raid on the night of September 24, was reported to the War Department by Gen. Pershing.

Aero Students Fired Upon

St. Louis.—J. C. Couch, civilian instructor at the Scott aviation field, near Belleville, Ill., flying with a student over Silver Creek, Sept. 28, was fired upon by an unseen assailant. A bullet penetrated the radiator of the machine, forcing the airmen to make a quick landing.

A searching party of soldiers was sent out from Scott field to hunt for the marksman, but no trace of him was found.

Important to Manufacturers

Preliminary specifications for International Standards of aeroplane materials are being issued by the International Airplane Standardization Board in Washington. This work has been in charge of Mr. F. G. Diffin, and copies of the Standards adopted may be obtained by manufacturers interested, by application to the International Aircraft Standards Board, Room 224 Bond Building, Washington, D. C.

All International Standards on aeroplane materials and fabricated parts in the future will be issued from that office and can be had on application.

Up to Chemists to Make Aircraft Safe

Dr. Charles Herty, editor of the Journal of Industrial and Engineering Chemistry, said in an informal talk at the Chemical Exhibition in Grand Central Palace, September 28, that the next great problem of chemistry will be in the field of aviation, to overcome the extreme vibration of air machines and their susceptibility to sudden changes of temperature.

"There is need of a chemical compound for the impregnation of Irish linen," he said, "in order to make it waterproof, airproof and slow burning. A device is needed to prevent the rusting of metal parts and the field of light alloys must be mastered."



Society watching the maneuvering of aeroplanes at the recent Piping Rock Show



The Pomilio aeroplane factory at Turin, Italy. Note the unusual type of factory construction obviating the usual obstruction of supporting pillars

British Flyers in Texas

Fort Worth, Texas.—Ninety-two members of the British Royal Flying Corps from Toronto, who will train in Fort Worth this winter, arrived on September 27. They are in command of Captain Seymour.

Mental Tests for Aviators

Cambridge, Mass.—To devise a standard by which the Government may determine in advance the mental qualities of student aviators, experiments are being conducted upon six young men at the Harvard psychological laboratory. The tests were begun recently and are under the supervision of Dr. C. C. L. Burtt, successor of Prof. Hugo Munsterberg at the head of the department of psychology.

Aeroplane Ambulance in France a Success

Paris.—Tests made on September 25 at Villa Coublay of an aeroplane fitted with two stretchers for carrying wounded proved highly satisfactory. Dr. Chassaing of the Army Medical Service and Corporal Tetu represented wounded passengers during a twelve-minute flight, the equivalent to a fifteen-mile journey.

Corporal Tetu declared that this form of transport was far superior to an ambulance of which he had vivid recollections when wounded two years ago. Dr. Chassaing removed a muffler from his head and unfastened straps during the flight. He expressed the opinion that there would be no unnecessary pain to a wounded passenger because the equilibrium of the aeroplane was so perfect.

The aeroplane was constructed by the aeronautic service of the army, which hopes to use this form of transport for the severely wounded, declaring that the absence of any jolting fully compensated the patient for any risk.

Girl Quickly Learns Exhibition Flying

Miss Berite Priest, formerly a much admired moving picture star of Los Angeles, has given up moving picture work entirely for a profession she finds even more fascinating. Miss Priest has shown unmistakeable aptitude for exhibition and fancy flying, and has earned the distinction of acquiring the skill for such work in a period covering only eight weeks, at the Crawford and Saunders school at Venice, Cal.

Mr. Leslie R. Saunders, of the Crawford-Saunders school, predicts a big future for Miss Priest, and although his school turns out a good number of pupils each month, Miss Priest's nerve and good judgment, so necessary in exhibition flying, stands out as an example for the others. Mr. Saunders is at present in Washington, where he will probably remain for a few weeks.

Air Power

While most of the volumes from the pens of Claude Grahame-White and Harry Harper usually lack the snap of originality, they usually contain a goodly portion of information and suggestion, and the latest volume, "Air Power: Naval, Military, Commercial," is not an exception to the rule. An American



Miss Bertie Priest, of Los Angeles, a former movie star, who demonstrated unusual alacrity in acquiring a knowledge of flying, as related elsewhere in this issue

edition of this work has just been published by Frederick A. Stokes Company. The chapter heads—The War By Air; Problems in Construction; Our Policy After the War; Factors of Safety; Popularizing Air Travel; Laws of the Air; The Commercial Era of Flight—are a guide to the contents of the book, which is well illustrated and wide printed.

Copies can be obtained from the Aeronautic Library, 280 Madison Avenue, New York—the price $3.00.

The Way of the Air

A most delightful little volume has just come from the press of Frederick A. Stokes & Co. under the title of "The Way of the Air." The author, Edgar C. Middleton, late Flight Sub-Lieutenant of the R. N. A. S., in his foreword to the book, states that the idea of the volume is "to give as clear and graphic a description of modern aviation as circumstances will permit; of the new, heroic race of men to which flying has given birth; of the conditions under, and the elements in, which their work is carried out, and the difficulties and dangers they have to encounter. Flying is essentially a profession for the younger generation. The strain is too great for men of more mature years. To withstand such strain requires all the vigor, the recklessness, the iron nerve of youth. It is a profession that offers an irresistible appeal to healthy-minded, sport-loving youths, to whom adventure is the nectar of existence."

Lieutenant Middleton has succeeded in his mission, and the volume should be read by every student aviator, or every man contemplating entering the air service. The book is obtainable through the Aeronautic Library, 280 Madison Avenue, New York, and the price is one dollar.

Army Aeronautics

Captain Charles H. Reeves, Jr., Aviation Section, Signal Officers' Reserve Corps, to active duty at Signal Corps Aviation School, Wilbur Wright Field, Fairfield, Ohio.

* * *

First Lieutenant Logan T. McMenemy, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mount Clemens, Mich.

* * *

Major Ralph P. Cousins, junior military aviation, Signal Corps, to Berkeley, Cal., as commandant of the School of Military Aeronautics, relieving Major Arnold N. Krogstad, junior military aviator, Signal Corps, who will proceed to Mount Clemens, Mich., and report to commanding officer, Signal Corps Aviation School, for duty.

University of Texas

Hubert Ambrister, Norman S. Archibald, William L. Bradfield, Fenton F. Caldwell, William P. Erwin, Harold W. Follmer, Louis G. Geisendorf, Harold A. Le Mar, James C. Malcolm, Leland G. McCullough, Merrill Keith Riddick, William T. Scott, Melmoth Y. Stokes, Paul Ward, and Alden S. Young.

Signal Reserve Corps

Peters, 1st Lt. H. B., to Mt. Clemens.

Willson, 1st Lt. E. V. K., to Memphis.

Ortmayer, 1st Lt. A. C., to make aerial flights.

Yarrow, 1st Lt. H. C., Jr., to Ft. Wood, and thence to Harrisburg for duty as Cmdg. Officer, supply depot.

Boernstein, 1st Lt. S. G., to Camp Alfred Vail.

Fuller, 1st Lt. W. P., previous order amended so as to direct him to Chief Signal Officer for duty.

Lowe, 1st Lt. C. O., to make aerial flights.

Gillette, 1st Lt. I. P., and Cooper, 1st Lt. E. H., to Ft. Wood.

Dominick, Capt. L., to Richmond, in command of General Supply Depot.

Mills, 1st Lt. B. H., to Ft. Sill.

Ferguson, Capt. J. E., to Buffalo.

Hill, 1st Lt. L. C., Jr., to Cmdg. Gen. Sou. Dept. for duty as asst. to aeronautical officer.

Following to Mineola:

CAPTAINS

G. D. Wooley, J. G. Rankin, G. G. Baetcke, T. K. Wright, J. D. Meads, G. F. Kearney.

Schermerhorn, Capt. S. S. V., to Camp Kelly.

Lindsley, 1st Lt. H. D., Jr., to make aerial flights.

Foote, 1st Lt. J. M., to make aerial flights.

Fisher, 1st Lt. B. F., hon. discharged.

Yarnall, 1st Lt. A. C., previous orders amended so as to direct him to report to Chief Signal Officer.

Lowe, 1st Lt. E., Jr., previous orders amended so as to direct him to report to Chief Signal Officer.

Jewett, Maj. F. B., to official business pertaining to Signal Corps.

Campbell, 1st Lt. W. L., to Chief War College Div. Gen. Staff.

NAVAL and MILITARY AERONAUTICS

Graduates of Army Aviation "Ground Schools"

Following is a list of the Army aviation ground-school graduates for the week ending September 22:

University of California

M. C. Anney, Eugene B. Bayley, Robert H. Bowles, Cecil H. Braddick, John Richard Burns, Myron Close, Richard R. Coleman, Jr., Justin P. Follette, Louis K. Godman, Frank D. Healy, Irving J. Higgins, Hubert S. James, Elmer E. Jonson, Eugene L. McCubbin, Ray L. Makin, Ralph M. Mero, Charles W. Pauly, Urban G. Robbins, Otis B. Schreuder, Glen J. Slater, Roy W. White, and Frank G. Davidson.

Cornell University

Lawrence H. Canan, James R. Carey, Leman O. Conley, Leroy R. Donahue, Edwin Doran, Winthrop C. Fanning, James S. Hand, Benjamin C. Jones, John S. McWilliams, Ejner C. Myland, Edward M. Ogden, Norman W. Oyseter, Arthur M. Palm, Earl W. Pugh, Henry Reukauff, Harry F. Thomas, Edward D. F. Whitehead, Francie H. Wilcox, and Ernest G. Wolds.

University of Georgia

Henry P. Asche, James H. Butler, Jr., Robert L. Collins, Louis M. Cotchett, Z. William Colson, Eugene T. Dennis, Samuel L. Ellis, Edward B. Hamer, Stanley W. Jacques, Barney T. Justesen, Milwood J. Palmer, William R. Roberts, G. Frederick Stark, Robert T. Stevens, and George V. Walker.

University of Illinois

Kingsley M. Brown, William Lee Campbell, George A. Carlton, Andrew K. Humphries, and Albert J. Lindauer.

Massachusetts Institute of Technology

Howard Rogers Clapp, Lloyd Roberts Clowes, Vincent J. Coletti, James M. Crummey, Lee H. Graham, Philip Edward Hassinger, Kent S. Kirby, Gilbert Malone, Samuel P. Mandell, Jesse C. Millard, John Monteith, Jr., Charles Henry Ramsey, Van Winkle Todd, and Andrew E. B. Tommers.

University of Ohio

Earl G. Colter, Wensell Gustayson, Charles H. Luethi, Carroll D. McClung, Oliver H. Stout, Clarence P. Wilcox, Aubrey A. Windt, and Richard W. Wright.

Princeton University

Leslie B. Cooper, Ralph Dryden, Clifford E. Gregory, Maurice McK. Hill, John J. Lyons, John G. McHugh, John J. Ney, William B. Peterson, John J. Quinn, and Frank C. Roberts, Jr.

University of Texas

Richard T. Aldsworth, John C. Baker, Arthur T. Bissonnette, Tom B. Bromley, Edward L. Brown, D. S. Bone, Homer L. Browne, Rodgers P. Brown, Clyde O. Faulk, Louis C. Hofmeister, Richard O. Hunman, Barnes M. Landry, Walter T. Meyer, Samuel O. Mathews, Lloyd N. Nash, John K. Nissley, Eugene D. Penn, Horace L. Pinkley, Paul C. Porter, Hubert H. Robers, Donald E. Walker, and Frank F. Wier.

* * *

Assignments

First Lieut. H. P. Schively, Aviation Section, to aviation station, San Antonio, Tex.

* * *

Capt. Stephen Haider, QM., O. R. C., to Belleville, Ill., and report to commanding officer Signal Corps, Aviation School.

* * *

Major E. V. Summer, Jr., Aviation Section to aviation station, Richmond, Va.

First Lieutenant Douglas C. Elphinstone, aviation section, Signal Officers Aeserve Corps, to active duty at Washington, D. C., and report to the chief, War College Division, General Staff.

* * *

Assistant to Aeronautical Officer

First Lieutenant Thomas Ferdinand Wilcox, aviation section, Signal Officers' Reserve Corps, to active duty at Governor's Island, N. Y., for assignment to duty as assistant to the department aeronautical officer.

* * *

First Lieut. A. E. Simonin, Signal O. R. C., to Mineola, L. I., and report to commanding officer Signal Corps aviation school; Capt. E. S. Schofield, Aviation Section O. R. C., to chief signal officer, Washington.

* * *

First Lieut. R. A. Allen, M. R. C., from duty Fort Riley, Kan., to Lake Charles, La., and report to the commanding officer, Signal Corps Aviation School.

* * *

Major J. B. Watson, Aviation Section O. R. C., to chief signal officer.

* * *

Capt. P. H. Magoffin, Aviation Section O. R. C., to Detroit, Mich.; Major A. W. Barry, Signal Corps, will report to commanding officer Camp Kelly, Texas.

* * *

First Lieut. D. C. Elphinstone, Aviation Section O. R. C., to Washington, D. C.

* * *

Capt. M. H. Grace, Aviation Section O. R. C., to Eastern Department, Governors Island.

* * *

Captain George F. Kearney, aviation section, Signal Officers' Reserve Corps, to active duty and report to chief signal officer of the army for temporary duty, and upon the completion thereof will report to Hazlehurst Field, Mineola, L. I., N. Y.

The acceptance by Colonel Sidney D. Waldon, Signal Corps, of his commission as colonel, Signal Corps, operates automatically to vacate his commission as captain in the Aviation Section, Signal Officers' Reserve Corps, effective that late.

* * *

Captain Lamont Dominick, Aviation Section, Signal Officers' Reserve Corps, to active duty at Richmond, Va., to assume command of the Signal Corps general supply depot at that place.

* * *

The resignation of Second Lieutenant John B. Snider, Fourth Infantry, New Jersey National Guard, is attached to the Aviation Section of the Signal Corps at Fort Sill, Okla.

These officers are announced as on duty which requires them to participate regularly and frequently in aerial flight:

Captain Carlyle Wash, Sixth Cavalry.

Captain George H. Peabody, Third cavalry.

First Lieutenant Junius H. Houghton, Sixteenth cavalry.

First Lieutenant James T. Denson, First cavalry, Alabama National Guard, will report for examination to determine his fitness for detail in the aviation section of the Signal Corps.

Major George W. Krapf, junior military aviator, Signal Corps, to Mineola, Long Island, N. Y., and report to the commanding officer, Signal Corps Aviation School, for duty.

First Lieutenant Byron H. Mills, Signal Officers' Reserve Corps, to Fort Sill, Okla., and report to commanding officer, School for Aerial Observers, for duty.

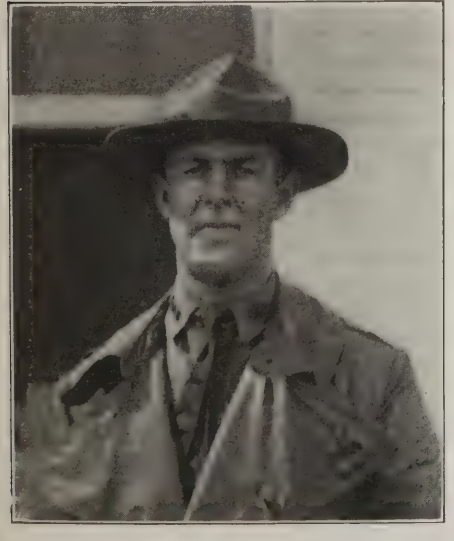
First Lieutenant Lon C. Hill, Jr., Aviation Section, Signal Officers' Reserve Corps, to active duty in Southern Department as assistant to the department aeronautical officer.

Captain James E. Ferguson, Aviation Section, Signal Officers' Reserve Corps, to active duty at Buffalo, N. Y.

Followed named officers, Aviation Section, Signal Officers' Reserve Corps, to Mineola, Long Island, N. Y., and report to comamnding officer, Signal Corps, Aviation School, for assignment to duty: Captains George D. Wooley, Thomas K. Wright, John G. Rankin, Jesse D. Meads.

First Lieutenant John C. Wilkinson, Medical Reserve Corps, to Dallas, Tex., and report to commanding officer, Signal Corps, Aviation Section, to be established there.

First Lieutenant Carl D. Gray, Medical Reserve Corps, to active duty at Porland, Me., in charge of the physical examining unit, Aviation Section, Signal Officers' Reserve Corps.



Major C. C. Benedict, former West Point Gridiron star, who now heads the Reservists at Chanute Aviation Field



Major Roy S. Brown, in charge of advanced flying at Hampton, Va.



Major Thomas Hanley, Jr., in charge of flying at Chanute Field



The most complete photograph of the Lafayette Escadrille (N 124) which has been received in this country. Standing (left to right): Messrs. Louberan, Doolittle, Campbell, Parsons, Bridgeman, Dugan, McMonagle, Lovell Willis, Jones, Peterson, Lieut. de Mason Rouge. Sitting (left to right): Wile, Masson, Lt. Thaw, Capt. Thirault, Lt. Lufbery, Johnson, Bigelow and Rockwell

First Liutenant Harry C. Yarrow, Jr., Aviation Section, Signal Officers' Reserve Corps, to Fort Wood, N. Y., for temporary duty and thence to Harrisburg, Pa., for duty as commanding officer. Signal Corps general supply depot.

First Lieutenant Earl V. K. Willson, Aviation Section, Signal Officers' Reserve Corps, to active duty at Memphis, Tenn., and report to commanding officer, Signal Corps Aviation School.

First Lieutenant Hallam B. Peters, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mount Clemens, Mich., and report to commanding officer, Signal Corps Aviation School.

Personnel of Army Aviation School at Austin, Tex.

Capt. Ralph P. Cousins, J. M. A., U. S. A., commandant.
J. M. Bryant, president of academic board.
First Lieut. Percy V. Pennybacker, adjutant.
First Lieut. Robert A. Trumbull, M. O. R. C., post surgeon.
First Lieut. J. W. Ramsay.
First Lieut. Theo. Bellmont.
Sgt. (First Class) Harry C. Bauder, Medical Department, duty in surgeon's office; in general charge of identification work.
Sgt. John H. Van Wicklen, Troop L, Third Cavalry; duties of sergeant major, preparation of orders, pay rolls, muster rolls, service records, etc.
Sgt. Van C. Smathers, Co. A, Nineteenth Infantry, drill instructor.
Corpl. L. F. Bowell, A. S., S. C., instructor in rigging, etc.
Pvt. (First Class) Milton A. Sandusky, Medical Department, clerk, recruiting, etc.
Pvt. David A. Miner, Medical Department, prophylaxis, orderly, assistant in physical examinations.
T. S. Painter.
James F. Rogan.
Edwin L. Porch.
Einer P. Juul.
Ralph Randolph, artillery observation.
Philip P. Cook.
Ernest W. Berkley.
Franklin Johnson.
Chas. B. Williams, rigging.
J. L. Thomas, lecturer, junior wing department, also signaling.
Mr. Morris, mechanic engine department.
S. L. Brown.
Hal C. Weaver.
C. E. Rowe.
J. A. Correll.
R. G. Tyler.
J. C. Higdon.
G. M. Merrill.
A. A. Wilkie, clerk to commandant.

War Department Aviation Orders

Special Order Number 216 to 221.

First Lieut. John F. Merrick, aviation section, Signal Officers' Reserve Corps, is assigned to active duty at the school for aerial observers, Fort Sill, Okla.

First Lieut. Paul R. Stockton, aviation section, Signal Officers' Reserve Corps, has been assigned to active duty at Mineola, Long Island, New York.

The resignation of Capt. William H. Mann, Signal Officers' Reserve Corps, has been accepted by the President.

First Lieut. Percival Dodge, aviation section, Signal Officers' Reserve Corps, is announced as on duty requiring him to participate frequently and regularly in aerial flights from August 20th, 1917.

First Lieut. Adolph J. Dekker, Signal Officers' Reserve Corps, has been relieved from duty at the Training Camp, Camp Alfred Vail, Little Silver, New Jersey, and ordered to Washington, D. C.

Major Adeli H. Gilkeson, junior military aviator, Signal Corps, has been relieved from duty at Princeton, New Jersey, and ordered to report to the commanding officer, Signal Corps Aviation School, at Rantoul, Illinois.

Major John F. Roehl, Signal Corps, has been ordered to report to the Chief Signal Officer of the Army for assignment to duty.

Colonel John J. Carty, Signal Corps, has been ordered to Washington, D. C. for temporary duty upon completion of which he will return to his proper station in New York, N. Y.

First Lieut. Frank Bahel, aviation section, S. O. R. C., has been ordered to proceed to Middletown, Pennsylvania, to report to the commanding officer, 113th Aero Squadron, for duty.

First Lieut. Frank W. Alsip, aviation section, S. O. R. C., is announced as on duty requiring him to participate frequently and regularly in aerial flights from July 30th, 1917.

First Lieut. Garland W. Powell, aviation section, S. O. R. C., has been assigned to active duty at Camp Kelley, South San Antonio, Texas.

First Lieut. Edward Burns, aviation section, S. O. R. C., has been relieved from duty at San Antonio, Texas, in order to proceed to Houston, Texas, and report to the officer in charge of instruction of aviation camps at that place for duty.

First Lieut. Henry D. Linsley, Jr., aviation section, S. O. R. C., is announced as on duty requiring himto participate regularly and frequently in aerial flights from August 20th, 1917.

First Lieut. John M. Foote, aviation section, S. O. R. C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from August 11th, 1917.

First Lieut. Claude O. Lowe, aviation section, S. O. R. C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from August 11th, 1917.

Major Maxwell Kirby, junior military aviator, Signal Corps, is relieved from duty at Fairfield, Ohio and ordered to proceed to Rantoul, Illinois, to assume command of the aviation schol of that place.

First Lieut. John H. Jouett, aviation section, Signal Corps, has been relieved from duty at the United States Army Balloon School, Fort Omaha, Nebraska, and ordered to report in person to the Chief Signal Officer, at Washington, D. C. for duty pertaining to military aeronautics.

First Lieut. Harold M. Lehman, Signal Corps, has been ordered to report to the Chief Signal Officer of the Army for assignment to duty.

Capt. Samuel S. V. Schermerhorn, aviation section, S. O. R. C., is assigned to active duty and ordered to report to Camp Kelley, South San Antonio, Texas, for temporary duty, upon the completion, will report to the commanding officer Aviation School, Camp Talaferro, Fort Worth, Texas.

Major W. Krapf, junior military aviator, Signal Corps, has been relieved from duty at the University of Illinois, Urbana, Illinois, and ordered to proceed to Mineola, Long Island, New York, and report to the commanding officer, Signal Corps Aviation School at that place, for duty.

First Lieut. Byron H. Mills, S. O. R. C., has



The Breese-Penguin monoplane, which was recently tested by Lieut. W. Denham, formerly of the R. N. A. S., shown in the machine at the right of the illustration

been relieved from duty at Fort Monroe, Va., and ordered to proceed to Fort Sill, Oklahoma, at the school for Aerial Observers.

First Lieut. Lon C. Hill, Jr., aviation section, S. O. R. C., is ordered to active duty and to report to the commanding general, southern department, for duty as assistant to the department Aeronautical Officer.

Capt. James E. Ferguson, aviation section, S. O. R. C., assigned to active duty and will take station at Buffalo, New York, reporting to the Chief Signal Officer of the Army by telegraph for assignment to duty.

The following named officers, aviation section, S. O. R. C., are relieved from their present duties and ordered to report to Mineola, Long Island, New York, reporting to the commanding officer, Signal Corps Aviation School, for assignment to duty; Capt. George D. Woolley, Capt. Thomas K. Wright, Capt. John G. Rankin, Capt. Jesse D. Meads, Capt. Gustave G. Baetcke.

First Lieut. John B. Schober, Signal Corps, has been ordered to report to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Hallem B. Peters, aviation section, S. O. R. C., is ordered to active duty at the Signal Corps Aviation School, Mount Clemens, Michigan.

First Lieut. Earl V. K. Willoon, aviation section, S. O. R. C., is ordered to duty at the Signal Corps Aviation School, Memphis, Tennessee.

Major James R. Alfonte, aviation section, Signal Corps, and Capt. Roy A. Wilson, Medical Reserve Corps, have been ordered to meet at the Signal Corps Aviation School, Mount Clemens, Michigan, for the purpose of examining applicants for commission in the aviation section, S. O. R. C.

First Lieeut. Harry C. Yarrow, Jr., aviation section, S. O. R. C., has been ordered to Fort Wood, New York, for temporary duty and thence to Harrisburg, Pa., for duty as commanding officer.

First Lieut. Andrew C. Ortmayer, aviation section, S. O. R. C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from August 27th, 1917.

Major Victor M. Dumas, Signal Corps, has been ordered to report to the Chief Signal Officer of the Army for duty.

First Lieuts. Ira Gillette and Edwin H. Cooper, S. O. R. C., have been order to report for duty at Fort Wood, at New York.

First Lieut. Sigismond G. Boernseine, S. O. R. C., has been ordered to Camp Alfred Vail, Little Silver, New Jersey, for duty.

First Lieut. William L. Campbell, aviation section, S. O. R. C., has been ordered to active duty at the War College Division, General Staff.

The following named officers of the Signal Corps will report in person to the Chief Signal Officer of the Army for duty: Colonel Robert L. Montgomery, Major Jesse G. Vincent, Capt. Arthur G. Cable.

First Lieut. Willard P. Fuller, aviation section, S. O. R. C., has been ordered to report to the Chief Signal Officer of the Army for duty.

Capt. Lamont Dominick, aviation section, S. O. R. C., has been assigned to active duty at Richmond, Virginia, to assume command of the Signal Corps general supply depot at that place.

First Lieut. Robert S. Simpers, Signal Corps, will report to the Chief Signal Officer of the Army for duty.

First Lieut. William D. Prindle, First Infantry, Minnesota National Guard, is attached to the aviation section of the Signal Corps and ordered to report to the commanding officer Fort Sill, Oklahoma, for duty at the school for aerial observers.

Capt. George F. Kearney, aviation section, S. O. R. C., has been assigned to active duty Signal Corps Aviation School, Mineola, Long Island, New York.

The following officers of the aviation section, S. O. R. C., are assigned to active duty at the Signal Corps Aviation School, San Diego, Cal.: Capt. Dean Smith, First Lieut. William G. Kollock, First Lieut. Gordon S. Ormsby.

Maj. John B. Watson, aviation section, S. O. R. C., has been assigned to active duty and ordered to report to the Chief Signal Officer of the Army for duty.

Capt. Paul P. Magoffin, aviation section, S. O. R. C., has been assigned to active duty, with station at Detroit, Mich., reporting by letter to the Commanding General, Central Department, Chicago, Ill., for duty.

Major Archie W. Barry, Signal Corps, has been ordered to Camp Kelley, South San Antonio, Texas, for duty.

First Lieut. J. Sloan Roberts, aviation section, S. O. R. C., has been assigned to active duty and ordered to Fort Sill, Lawton, Okla., at the School for Aerial Observers.



Major J. D. Dunsworth, head of the Chanute Aviation Field, to sail shortly for France

First Lieut. Wade H. Glascock, S. O. R. C., is assigned to active duty at Fort Sam Houston, Texas, reporting to the commanding general of the Southern Department for duty.

The following named officers of the aviation section, S. O. R. C., are assigned to active duty at the School of Military Aeronautics, University of California, Berkley, Cal.: First Lieut. Roy J. Heffner, First Lieut. Lloyd T. Jones.

First Lieut. Thomas Ferdinand Wilcox, aviation section, S. O. R. C., is assigned to active duty and ordered to report to the commanding general, Eastern Department, Governors Island, for assignment to duty as assistant to the departmental aeronautical officer.

First Lieut. Arthur E. Simonin, aviation section, S. O. R. C., is assigned to active service and will proceed to Mineola, Lang Island, and report to the commanding officer of the Signal Corps School, for duty.

Capt. Earl S. Schofield, aviation section, S. O. R. C., is asigned to active duty and ordered to report to the Chief Signal Officer, Washington, D. C., for assignment to duty.

First Lieut. Frederick T. Ealand, aviation section, S. O. R. C., is assigned to active duty at the Signal Corps Aviation School at Waco, Texas.

First Lieut. Lawton V. Smith, aviation section, S. O. R. C., announced as on duy requiring him to participate frequently and regularly in aerial flights from August 25, 1917.

The following named officers of the aviation section, S. O. R. C., are assigned to active duty and will report in person to the commanding officer, Camp Kelley, South San Antonio, Texas, for assignment: First Lieutenants Hayward H. Kendall, Thomas D. Broad, Frank P. Ellsworth, Gordon H. Keller and Capt. Ammi Brown.

Major Harold M. Clark, junior aviator, Signal Corps, is relieved from duty at San Antonio, Texas, and will proceed to Fort Kamehameha, Hawaii, and assume command of the 6th Aero Squadron, at that place, relieving Major John B. Brooks, junior aviator, Signal Corps, who will proceed to San Francisco, Cal., reporting, upon arrival, to the Adjutant General of the Army for instructions.

Capt. Walter Brewer, aviation section, S. O. R. C., is assigned to active duty at Governors Island, as assistant to the department aeronautical officer.

The following named officers of the aviation section, S. O. R. C., are assigned to active duty at Mineola, Long Island, N. Y., reporting to the commanding officer, Signal Corps, general supply depot for duty. Capt. Lewis G. McGuigan, First Lieut. D. Dwight Douglas.

First Lieut. Asa J. Etheridge, aviation section S. O. R. C., is assigned to active duty at Scott Field, Belleville, Ill.

First Lieut. Alfred P. Bourquerdez, Jr., aviation section, S. O. R. C., has been ordered to duty at Camp Kelley, South San Antonio, Texas.

First Lieut. Lionel M. Woolson, Signal Corps, will report in person to the Chief Signal Officer of the Army for duty.

Capt. George F. Kearney, aviation section, S. O. R. C., has been ordered to temporary duty with the Chief Signal Officer of the Army, upon the completion of which he will report to the commanding officer, Hazlehurst Field, Mineola, Long Island, New York, for duty.

The acceptance by Col. Sidney D. Waldon, Signal Corps, on August 27, 1917, of his commission as colonel, Signal Corps, operates automatically to vacate his commission as captain in the aviation section, S. O. R. C.

New Curtiss Corporation Formed

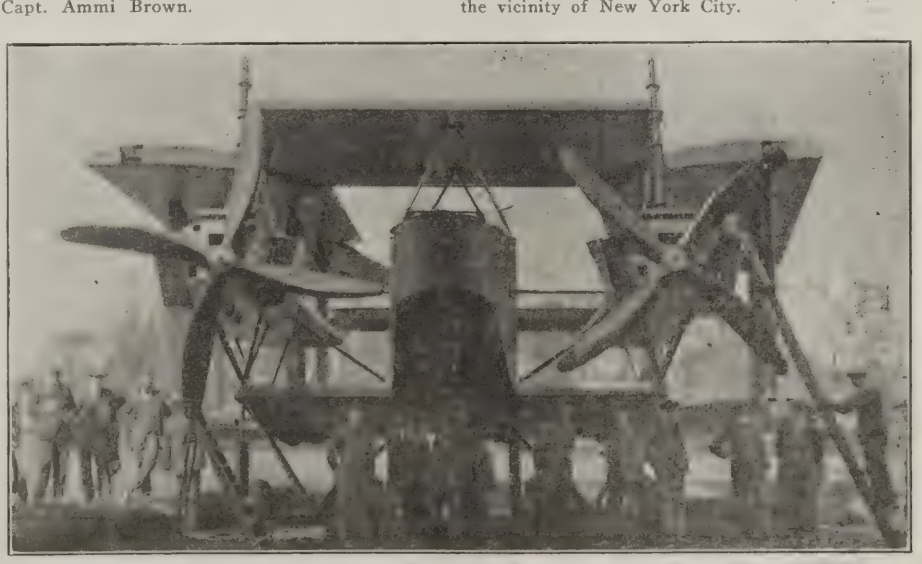
Buffalo, N. Y.—Announcement is made of the formation of a new Curtiss company known as the Curtiss Engineering Corporation, to be located in Garden City, Long Island, N. Y.

The purpose of the organization is to provide for special experimental and research work which it is felt at the present is very necessary to the progress of aviation. The location near New York was chosen for obvious reasons; the supply of materials used in experimental work being good and the Government's aviation activities on Long Island rendering the establishment of an aeronautical laboratory and small manufacturing plant there desirable.

The officers of the new corporation are Glenn H. Curtiss, President; K. B. MacDonald, Vice-President; C. M. Keys, Treasurer, and J. P. Tarbox, Secretary.

Work on the new plant, which is located on Stewart Ave., Garden City, has been going on for some time and it is expected that November 1st will see the whole plant in operation. About 300 men will be employed.

Messrs. Curtiss, MacDonald and Keys will still remain as officers of the Curtiss Aeroplane and Motor Corporation, though they will reside in the vicinity of New York City.



The twin-motored Handley-Page biplane with wings folded back. A most efficient bombing machine

THE HARLEY-STROMER TWIN FORD-MOTORED HYDROAEROPLANE



THE accompanying illustrations show the Harley-Stromer Hydroaeroplane rising from the Willamette River, carrying a passenger. Two Ford motors are used. Gus Stromer, the builder and inventor, is over six feet in height and weighs two hundred pounds. Many passengers were carried during the 19 months the machine was in use.

The hydropaeroplane has a range of speed from 38 to 65 miles an hour. Over 700 flights have been made, a large portion of them with passengers, and no accidents ever occurred or repairs necessary.

Mr. F. C. Harley, Mayor of the city of Astoria, Oregon, is backing the inventor in his work. A new machine is being erected near New York City for the purpose of demonstrating the same to the United States and Allied Governments. It is stated that this hydroaeroplane will be put on the market for $3,000.

SPECIFICATIONS OF 1½-TON AVIATION TRUCK

THE trucks used by the Signal Corps for aviation use will not be the standard war trucks now being made for general army transport owing to the special nature of the work. The Signal Corps will have two sizes of truck, one light and the other a more normal 3-ton job. There will be approximately two of the light type to each one of the heavy. Both trucks will be special assembled propositions, made from standard parts, and the first orders have been given to General Motors for the light type and Kelly Springfield for the heavy.

Specifications for the heavy truck are now being drafted in final detail, and will be issued shortly.

In a squadron there will be about twenty-seven trucks, two-thirds at least being the light model. One of the large trucks will be a traveling repair shop.

The specifications for the light trucks are as follows:

General Provisions—The load capacity on pneumatic tires shall be 2000 to 3000 lb.

For chassis outline, see drawing General Motors Truck Co.'s No. C-7202.

Wheel Base—149 in.

Frame Length—Behind driver's seat, 121⅜ in., approximate.

Tread—Front wheels 58¼ in. Rear wheels, 58¼ in.

Motor—Continental C2 built especially for truck service. 35 actual horsepower. Vertical four-cylinder, four-cycle, water-cooled, located under the hood in front of dash and carried on three point suspension in a unit with clutch and transmission. Cylinders L type, cast in block, 4⅛ in. bore, 5¼ in. stroke. Crankshaft drop forged, heat treated steel on three extra large bearings. Cams forged integrally with camshaft, hardened and ground. Camshaft carried on three extra large bearings. Connecting rods drop-forged and heat-treated. All bearings die cast babbitt in bronze shell. Wrist pins hardened and ground working in bronze connecting rod bushings. Valves 2 in. diameter, fully inclosed by removable cover plate. Helical timing gears. Aluminum crankshaft.

Oiling System—Combination force feed and constant-level splash system. Plunger pump driven by eccentric on camshaft, supplies oil to timing gears and to each main bearing. Oil drains back into oil pan which forms lower half of crankcase, keeping constant level for splash lubrication of pistons, connecting rod and camshaft bearings. Oil gage on dash. Indicator on crankcase shows depth of oil. Strainer in oil pan keeps oil in crankcase free from dirt, sediment, etc.

Carbureter—Marvel 1 in. automatic float-feed type, with throttle operated either by hand lever or foot accelerator.

Ignition—Jump spark, single system. Eisemann high-tension, water-proof magneto. Spark control lever above steering wheel. Switch on dash.

Cooling System—Shaft-driven centrifugal water circulating pump, 18 in. fan on ball-bearing driven by V-shaped leather belt. Special truck design tubular radiator of extra large water capacity, with cast iron top and bottom tanks and side frames, rigidly bolted to chassis frame. Entire radiator can be easily taken apart, for thorough cleaning, and any individual part can be replaced without purchasing an entire new radiator.

Governor—Monarch automatic governor, fully inclosed and Yale locked, operates special valve above carbureter independent of hand and foot throttle.

Control—Left-hand drive, center control, spark and throttle levers above steering wheel; also a foot accelerator. Levers move forward to advance spark and open throttle. Clutch and service brakes operated by pedals. Gear changing and emergency brakes operated by hand levers.

Clutch—Multiple-disk dry-plate clutch, in unit with motor and transmission. Clutch shaft mounted on ball bearings, with ball thrust bearing on clutch throw-out collar.

Transmission—Brown-Lipe and G. M. C. Sliding gear, selective type. Four speeds forward and one reverse with direct drive on fourth speed. Ball bearings throughout. Carried in unit with clutch and motor on three-point suspension, permitting direct connected gear shift lever. Low gear reductions give unusual pulling power when needed.

Drive—A solid steel shaft of large diameter from transmission to rear axle. This shaft is in two sections with three universal joints and is supported in center on a self-aligning ball bearing. This construction prevents vibration, whipping and springing out of shape, to which a long unsupported shaft is liable, with resultant wear and strain on the universal joints and bearings at each end. The three universal joints are simple and rugged, require no adjustments, and are contained in dustproof, waterproof and grease tight housing.

Front Axle—Drop forged I section, 2¾ in. high by 2 in. wide. Steering knuckles drop forged and heat treated, with hardened and ground steel bushings in wearing parts provided with grease cups. Knuckle tie rod is back of axle, where it is safe from accidental bending.

Rear Axle—Timken-David Brown worm of special alloy steel, and worm gear of special bronze. Gear reduction 7¾ to 1. Semi-floating driving shafts of chrome nickel steel, heat treated, of large diameter, with splined inner ends and outer ends tapered and keyed to rear wheels. Shafts can be easily removed. Differential-bevel pinion differential with four pinions. All gears drop forged, hardened and heat treated.

Radius Rods—One section adjustable, with swivel front end connection. All wearing parts bushed with provision for lubrication. A direct positive connection between the driving axle and the chassis frame relieving the rear spring of all driving strains and thus adding materially to the life and efficiency of the spring.

Springs—Semi-elliptic, high carbon, oil tempered steel, with bronze bushed eyes. Spring bolts hardened and ground, and fitted with grease cups. No center bolts. Extra heavy spring blocks, top and bottom, with extra heavy nickel steel spring clips. Front springs, 2½ in. wide by 36 in. long. Rear springs 3 in. wide by 54 in. long.

Brakes—Duplex system, consisting of four Raybestos lined brake shoes expanding in a pressed steel drum on each rear wheel. The two opposite shoes in each drum are service brakes, operated by pedal, and the other two opposite shoes are emergency brakes operated by hand lever. Brake rods are so arranged that when service brake shoes become worn the emergency brake shoes can be used for service brakes by simply crossing the brake rods.

Wheels—Artillery type, wood, Timken rol-

(*Continued on page* 164)



The Harley-Stromer twin Ford-motored hydroaeroplane described above.

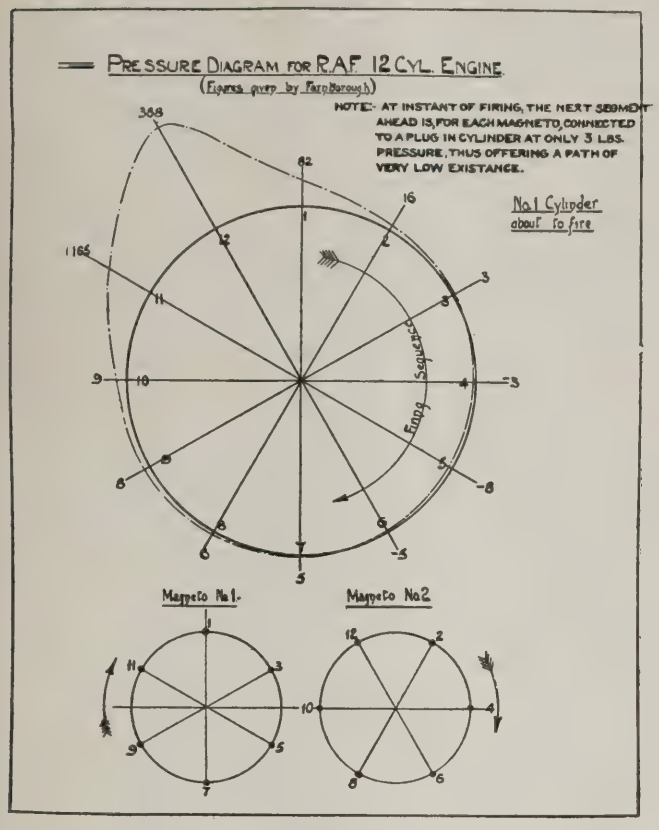


FIG. 7.

(c) The "Spark-Cap" type of Distributor and Brush.

When discussing this question it is not out of place to consider what it termed the "spark-gap" form of distributor. A common trouble experienced with the ordinary type of distributor in which a carbon brush is used is that the carbon dust generated is liable to be ground into the brush track of the distributor, thus producing a path of low resistance between the segments, this disease being known as "tracking." In certain cases, and particularly when two six-cylinder magnetos are used in conjunction on a 12-cylinder engine, tracking of this kind is very liable to cause misfiring, because the spark, rather than discharge between the electrodes of the spark plug in the cylinder under compression, will leap along the surface of the brush track in the direction of rotation to the next segment which is connected to a spark plug in a cylinder at practically zero pressure, the resistance of this alternative path being extremely low. (See Fig. 7.)

Experiments have shown that even with a distributor that is badly tracked misfiring can be entirely eliminated if, instead of the ordinary carbon brush, a metal brush be used, this being so arranged that there is a very small air gap (about 0.01 in.) between the face of the retating metal brush and the distributor segment. The superiority of this arrangement over the distributor and carbon brush combination would seem to be due to the fact that the introduction of a small air gap in the high-tension circuit, such as is iterposed between the end of the secondary winding and the outside circuit, completely insulates the secondary during the small interval of time T_1, and thus allows the voltage to rise to a very much higher maximum value than would be the case if there were any leakage paths of low resistance.

This is a further confirmation of the view that the value of the maximum value of the secondary voltage at "break" is of vital importance, and I would add that the spark-gap form a distributor has been tried with considerable success on aeroplanes magnetos both in this country and in France, and, as a matter of fact, it is used generally on all the battery ignition systems designed for automobile work in use in America. In my opinion it would seem to be an advance in the right direction provided that sufficient care is given to the design of the brush holder and proper precautions are taken to ventilate the distributor so that the products of ionisation resulting from the minute spark between metal brush and segments have easy means of escape. This has been done in the type "A" magneto which I shall describe in detail later, and many thousands of these machines fitted with this special form of distributor brush have been supplied for use on aeroplanes, and the consensus of opinion seems to be that the arrangement adopted is entirely satisfactory.

(6) Magnets—Importance of Flux

The function of the magnets is to produce and maintain, in spite of the very severe conditions under which a magneto has to operate—including severe vibration and cyclic changes in temperature—a practically constant flux in the armature core. I have already shown that the energy librated in the high-tension spark is substantially proportioned to the square of this flux, so that the necessity of using magnets of correct design and superlative quality is at once apparent.

For any given machine using magnets of some definite design the value of the armature core flux "N" is naturally dependent on the magnetic characteristics of the magnets used. In comparing permanent magnets of different quality, it is usual to determine the remanence (B_R) and the coercive force (C_F). These factors apply to a closed ring of the steel which is capable of being completely and uniformly magnetised. By varying the current in the magnetising coil, the steel can be taken through a cycle of magnetisation, as depicted by the hysteresis loop shown in Fig 8. What is meant by remanence and coercive force can be better appreciated by refering to this diagram. The remanence is the flux density in the steel, after the magnetising force Hmax (usually 400) has been removed, and the coercive force is the demagnetising force that has to be subsequently applied to reduce this flux density to zero. When testing a magneto magnet, the ideal "ring" condition can be approximated by bridging the poles with a solft iron keeper and suitably winding the magnet. A fundamental test of this kind is, however, attended with considerable difficulties.

It is the practice of the B.T.H. Company, and, I believe, of most other magneto manufacturers in this country, to test every magneto by means of certain special apparatus before it is fitted to a magneto, to determine both of these factors. So far as we are concerned, we accept only those magnets which show on this magnetic test a remanence and coercive force in conformity with the following:—

(1) The product of remanence and coercive force in C.G.S. units must not be less than 580,000.

(2) The actual coercive force must not be less than 55.

Experiment has shown that the active armature core flux in a magneto of given design is greatly dependent on the product of remanence and coercive force, or up what I shall term the "magnet strength," using this expression to denote the factor $\frac{(B_R \times C_F)}{10^4}$. The spark energy output, being proportional to the square of the armature core flux, must in consequence be dependent on the magnet strength to a much greater degree.

The product remanence and coercive force is therefore a very important factor, and, generally speaking, it is sufficient when testing magneto magnets to measure this product only, because as a general rule a magnet which shows a product of not less than 580,000 will have a coercive force not less than 55. In other words, such a relatively low coercive force as 55 is usually associated with a remanence of the order of 10,500.

Looking at a magneto magnet from a purely mechanicle standpoint, it is necessary that the pole faces, and also the edges, should be finally ground after hardening to a fairly fine degree of accuracy. It is of great importance that the ground pole faces be parallel to each other and exactly at right angles to the ground edges. Some idea of the degree of accuracy required can be gathered from the following limits, which are now being worked by the Sheffield manufacturers:—

Distance between the ground pole faces—Maximum + .2 mm.
" " " " " —Minimum — .2 mm.
Width of magnet—Maximum + .15 mm.
" " " —Minimum — .15 mm.

These limits may at first sight appear to be large, but it should be remembered that a hardened Tungsten steel magnet is a very difficult thing to grind, particularly when it comes to grinding the inside pole faces, because trouble is encounted, due to the springiness of the magnet itself.

Before leaving this aspect of the problem, I should like to make some reference to the very excellent way in which the various Sheffield steel manufacturers now engaged on the manufacture of permanent magnets have carried out their work. Bearing in mind that at the outbreak of war practically no permanent magnets were produced in this country, and that this subsidiary key industry was entirely in the hands of Germans, I think that all those who have been closely in touch with the development of a magnet industry in this country will agree that the results so far achieved are very gratifying, and reflect great credit on the British steel manufacturers, who, by virtue of their resourcefulness and skill, have grappled so successfully with this difficult problem. Our own experience is that at the present time permanent magnets for magnetos are being produced in this country which are quite equal—and in many cases superior—to anything that has been produced in Germany in the past, and I am glad to know that Mr. E. A. Watson, Technical Director of the M.L. Magneto Syndicate, Ltd., hold views* which coincide with my own in regard to this important question.

* See letter in "Autocar" for February 12th, 1915, page 215.

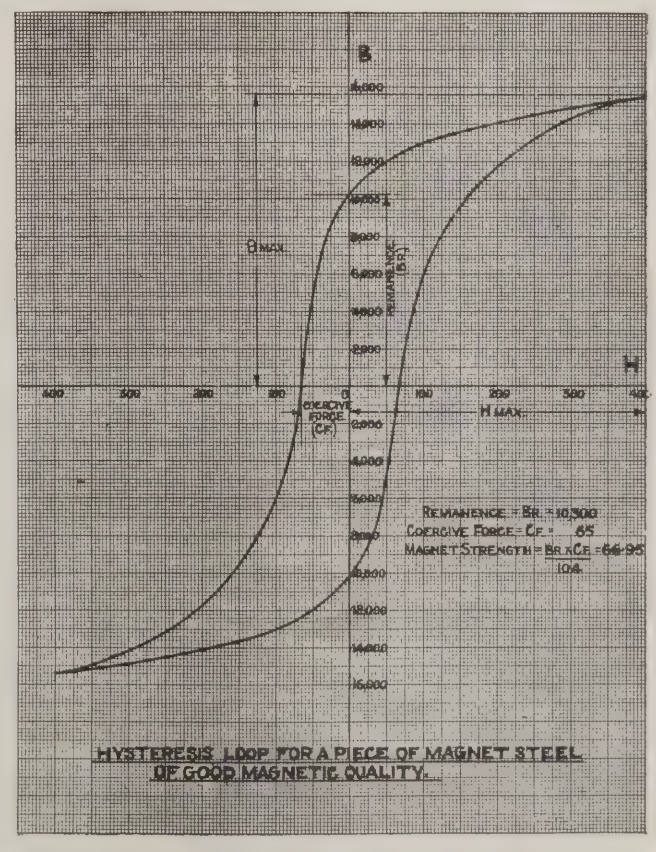


FIG. 8.



MILITARY AEROSTATICS



Spherical Balloon Pilot Certificates

issued by the Aero Club of America during the week ending Sept. 29:

No. 121—Ray W. Thompson.
No. 122—Birge M. Clark.
No. 123—H. Lee Meyers.
No. 124—Roland Gaupel.

Dirigible Versus Aeroplane

On the advantage of the dirigible over the aeroplane for certain purposes M. Julliot has some very decided views. These he gives in this manner:

"Your government is thoroughly alive to the possibilities of the lighter-than-air craft. Its advantages for certain purposes over the many types of aeroplanes and seaplanes lie in the face that it answers the requirements of both. The pilot is the complete master of its speed and direction. He can remain stationary for hours at a time, in still air, or he can attain a speed of forty-five miles an hour under the same conditions. When the wind blows the big bag becomes part of it and moves at the same speed. If the pilot wishes to change his course from that of the wind he opens the gas cocks of the bag and seeks a lower strata of air or throws out sand or water ballast until he has risen to a higher strata, where he can again pursue his course at will with his powerful eight cylinder-driven propeller. You cannot do this with an aeroplane. You are either rising or falling and at the same time maintaining a high speed.

"The dirigible is just as big a part of the war machine today as it ever was. In fact, its possibilities are limitless. The attempts by the German government to use it as a terrible offensive machine are well known. The consequences are also well known. But the German government has yet to realize that the dirigible because of its vulnerability is not an offensive machine—at least, in its present construction. But as a scout cruiser over harbors and coast lines it has no equal. Its radius of vision is greater than that of any ship and at heights to which it can ascend, it is virtually safe from an explosive shell that might be directed from a hostile warship.

"The chances of a hostile warship ever approaching within range of the balloon are too remote to even deserve consideration," he continued. "Therefore, let it be remembered that the dirigible in its present form is really a patrol boat of the air. The United States with a big fleet of dirigibles could keep better watch over its shores than it could with ten times the number of ships."

Because of its sensitiveness, M. Julliot added, the dirigible requires the most careful of guides.

"The dirigible is no car for a student," he said. "For instance, you might be flying serenely along in the sun and suddenly the sun slips behind a cloud and you find yourself falling rapidly. The cooler air has caused the gas in the envelope to contract. Then again, in experiments I have found that in the sunlighted air you can cause a dirigible to drop suddenly by simply placing a leaf on top of it. Then still again at night, when the air is cool, the ascent or descent of the balloon can be controlled by the direction of a powerful searchlight upon the bag."



An observation kite balloon ascending for practice in artillery spotting

(Passed by the Censor)



An observation kite balloon packed up ready for transportation on one of the European fronts

FOREIGN NEWS

BELGIUM

An official statement issued by the Admiralty says that on Tuesday night, Sept. 27, British naval aeroplanes dropped many tons of bombs, making several direct hits, on the railroad lines at the Thourout Junction, the Lichtervelde Junction and the Cortemarck Junction.

There were bombing raids by naval aircraft on the following objectives: The lockgates at Zeebrugge, the St. Denis-Westrem Aerodrome, the Gontrode airship shed, the Houttave Aerodrome.

The bomb-dropping at Zeebrugge appeared to be good, while at Houttave bombs fell among hangars and huts on the southwest side of the aerodrome. Seven tons of explosives were dropped.

On Sept. 29, Belgian aeroplanes were very active. Two Belgian aviators pursued enemy machines which were proceeding in the direction of Dunkirk and Calais.

FRANCE

The fifty-three German machines officially credited to Captain Guynemer, reported "missing" since September 11, were worth more than $300,000. Some of them were manned by two or three men, and it is estimated that he accounted for more than eighty pilots, observers and gunners.

The Lafayette Escadrille had encounters with the famous German flying squad known as Wolf's Tango Flock on Friday and Saturday the 23rd and 24th. In each battle the Americans were outnumbered, but fought off the enemy machines and reached their own lines in safety.

On Friday Lufbery, flying alone, attacked one machine of the Wolf flock and in turn was attacked from above by three others who had been waiting until the decoy aviator attracted an assailant. Lufbery was forced to turn tail toward the French lines.

Rockwell, Jones, Bridgman and Parsons attacked three Germans and sent them down. There is reason to believe one was smashed.

On Saturday Thaw was surrounded by the Tango flock, but escaped after a lively machine gun battle. Marr's machine was riddled and all the commands were cut by explosive bullets, but he landed safely.

Thirteen Germans altogether attacked the American fliers. Lieut. Lufbery brought down his twelfth enemy machine, for which he received official credit, and later sent down another, which was not recorded as official.

Paris, Sept. 30.—Army citations do not appear in the "Official Journal" until weeks after they have been issued, and yesterday's issue of the journal contains the citations of Guynemer, the famous aviator, recently killed in battle, for his thirty-sixth, thirty-seventh and thirty-eighth victories, calling him "the incomparable chaser pilot."

The same issue refers to Raoul Lufbery, of the Franco-American Flying Corps, as "an incomparable pilot, who is a living example for his escadrille of intrepidity, coolness and devotion." He downed his tenth enemy on June 12.

GERMANY

Berlin, Sept. 26.—One of the German aeroplanes which took part in last evening's raid over England has not returned, it is announced officially. The raiders, the statement says, attacked London and the English coastal towns "on both sides of the Channel."

Sept. 30.—The following official announcement was given out here today:

Our aviators attacked docks and warehouses in London, as well as Ramsgate, Sheerness, and Margate. The effect of the bombs was recognizable from conflagrations caused. Our aeroplanes returned undamaged.

GREAT BRITAIN

Aeroplanes and Zeppelins both raided England on Sept. 24. London was bombed for nearly an hour. Six persons were killed and twenty wounded, according to early reports.

The counties of Kent and Essex were visited before London was attacked. Zeppelins accompanied a second aerial flotilla that invaded Lincolnshire and Yorkshire to the north.

London, Sept. 29.—Two German aeroplanes of a squadron of twenty which unsuccessfully attempted to raid London last night were brought down by British defenders, Lord French announced today.

Every defensive resource was utilized in beating back the aerial invaders—anti-aircraft guns firing special shells and rockets, and a fleet of British aircraft.

From unofficial accounts it appears that the raiders did not even succeed in penetrating the outer defences of London, but were forced back by the provincial guards and guns. They dropped a few bombs, with no appreciable damage, over southeastern counties.

London, Sept. 30.—The London district was again raided tonight by German airmen. This is the fifth raid of the week. There is a circumstantial but unconfirmed report that one enemy machine was brought down.

CANADIAN ARMY HEADQUARTERS IN FRANCE, Sept. 29.—A German aeroman, brought down wounded and taken prisoner last night, asserted that Guynemer, the famous French air fighter whose fate has been uncertain since he disappeared behind the Teuton lines, was killed in battle with a German aeroplane. Guynemer was buried, the prisoner said, just behind the front line.

ITALY

Captain Laureati, of the Italian Army, accompanied by an observer, on Sept. 24, made a non-stop aeroplane flight from Turin, Italy, to London. He covered the 656 miles in seven hours and twelve minutes.

He left Turin at 8:28 a. m., Italian time, and landed at Hounslow at 2:50 in the afternoon, having completed a journey of 656 miles in 7 hours 22 minutes 30 seconds.

Captain Laureati flew an Aila machine and carried a mechanic as passenger and two machine guns.

From Turin he followed the railway as far as Susa, on the Italian frontier. Crossing the Alps by Mont Cenis at an altitude of nearly 12,000 feet, he passed over Lanslebourg and rejoined the railway at Modane.

During the crossing of the Alps he encountered rough weather, and throughout the whole journey had to face a strong northwesterly wind.

From Modane, still following the railway, the airman travelled northwest to Culoz, which he reached in an hour and forty minutes from Turin, and, continuing on the same line, passed over Verdun-sur-le-Doubs. He crossed the Cote d'Or Department and proceeded by way of Flavigny and Bussy across the Department of Seine et Marne, passing to the east of Paris and completing his transit of France by way of Compiegne, Amiens, and Cap Gris Nez.

Throughout this part of the journey he kept an average height of about 9,900 feet. He crossed the Channel in fifteen minutes, dropped to 2,000 feet to pick up his bearings and completed his journey to Hounslow without misadventure, except for a slight detour made in error over Hendon.

He carried with him, in addition to copies of the current issue of Gazeta del Popolo, an autograph letter from the Italian King to King George and letters to Lloyd George, Lord Derby, Mr. Balfour, Lord Montague, of Beaulieu, and the Lord Mayor of London.

He was none the worse for his journey. During the flight he took food from a bottle fastened inside his coat and fitted with a rubber tube like an infant's feeding bottle.

Laureati distinguished himself on August 26 by making the journey from Turin to Naples and back, a distance of 920 miles, without descending.

On the morning of Sept. 26, Italian aeroplanes bombarded railway establishments in the Podberda Bassa Valley, and in the afternoon those of the Prosecco coastal line. Altogether five tons of bombs were dropped with visibly effective results.

Italian aeroplane squadrons carried out another extremely successful raid on the Austrian naval base at Pola on Sept. 27. Scores of machines, shielded from observation by a thick mist, penetrated the fortified maritime centre of Pola, and rained more than three tons of high explosives on the arsenal and the submarine base at Olive Reef, inflicting great damage.

Italian airmen were also active on the fighting front along the Isonzo, seriously hampering railroad traffic in the Brazza Valley and destroying the railroad plant at Podserda.

Milan, Sept. 30.—Italian aviators scored another fine triumph yesterday when a new type of chaser aeroplane, designed by two young officers belonging to the Italian aeronautic corps, covered the distance between Turin and Rome in 2 hours and 50 minutes at an average speed of 137½ miles an hour.

MEXICO

Mexico City, Sept. 26.—A new type of aeroplane, with small wing spread and high speed, is being made in the government aeroplane factories. The 'planes formerly made will be used as observation machines.

RUSSIA

Petrograd, Sept. 29.—Russian airmen recently downed four enemy machines. One machine fell inside the enemy's lines. In the Fokshani region a Roumanian airman downed an enemy aeroplane. Russian airmen dropped a few hundredweight of bombs on the enemy's supply depots along the River Stockhod and on the villages of Cigany and Losyach, while southwest of Husiatyn Russian airmen dropped several hundredweight of bombs on Sorostkoff, where fires broke out and a panic was observed. All the Russian bomb droppers returned safely notwithstanding the attacks of enemy airmen and a terrific fire from anti-aircraft guns.



Captain George Guynemer, most famous of French aviators, with an official credit of fifty aerial victories, and now reported dead. He had received practically every decoration his country could give, a few of which he is here wearing



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

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c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Some Remarks on Steam Plants for Model Aeroplanes.

(*Concluded from Page* 118)

Also, the fuel discharge to the burners should be proportioned to the water delivered to the boiler. For instance, any diminution in the supply of water to the boiler at once results in an increase in the temperature of the steam—the fuel flame being supposed constant. Actual experiment has, however, shown that when once the lamp flame is initially correctly adjusted (by means of a needle valve), but little, if any, further adjustment is necessary throughout the trial. The same, however, cannot be said to hold in the case of the water supply. The value of using superheated steam in such a case as this can hardly be overestimated. In the first place, there is the elimination of the loss of heat due to initial condensation on entrance into the cylinder, amounting, as it sometimes does, to as much as 25 per cent. The work done by the steam during the expansion portion of the stroke is performed at the expense of the heat energy of the working fluid, and, in consequence, the temperature of the steam and the inside walls of the cylinder possess the same temperature as the steam, and therefore at the end of the expansion stroke they will have a far lower temperature than that of the initial stroke.

Also the fall of pressure which takes place when the exhaust valve is opened will be accompanied by a fresh fall of temperature, and therefore at the end of the exhaust stroke the entering steam will come into contact with, comparatively speaking, cold walls, and if not superheated to a sufficient extent to raise the temperature of the walls and piston at least to that of dry saturated steam at the same pressure condensation must result.

Re-evaporation of the condensed water during the exhaust also tends to lower the temperature of the cylinder walls. As soon as the steam commences to expand in the cylinders the pressure begins to fall and the water present, having its pressure lowered, begins to evaporate; the amount, however, which is converted into steam is very small. The greater part being either evaporated at the end of the expansion when it is not of much use for doing any useful work, moreover, the evaporation that takes place not only cools the walls of the cylinders, but increases the back pressure upon the piston, thus directly reducing engine power; and in the case we are considering no second cylinder can be employed to in any way compensate this.

Again, the actual weight of steam used will of course be increased when actual condensation does take place—if the same position of cut-off be retained, as an increased volume of steam must be admitted to take the place of condensed water. As to the degree of superheat to be used, in the case of automobile practice, some designers only superheat sufficiently to prevent condensation on admission to the cylinders, while others employ a degree of superheat which permits of even the exhaust steam to be superheated.

In the case of a steam plant for (small) model aeroplanes, the degree of superheat which can be employed largely depends, in fact it might be said it entirely depends, on the manner in which the engine is lubricated; experiment has clearly shown that it is not a very difficult matter in a small plant to have an excess of superheat, and that the disadvantages, if the superheating be carried too far, considerably outweigh the advantages.

Victoria Aero Club
(Australia)

From Mr. C. A. Wragg, secretary of the Victoria Aero Club, Melbourne, the following interesting letter has arrived, relating how a few enthusiasts down that part of the world are "doing their bit" for the furtherance of aviation:

"The club was formed some twelve months ago by a few keen and kindred spirits, and has since been steadily growing. The meetings are held monthly, at which we generally manage to put in an intersting evening. At our next meeting a paper will be given by Mr. G. Hawker, on aero engines. We propose, as a club, to construct and experiment with gliders, to popularise gliding as a sport, to establish a library on the subject for the use of members, and, in fact, to do anything that will tend to promote interest in aviation. Very little can



The Victoria glider in flight

be done now, of course, because of the war; a number of the members have sailed with the Australian Flight for active service.

"Enclosed are photos of a few of the members with a glider, which was presented to the club by Dr. F. M. Johnson, who is now, we believe, in England. It had then no front elevator or vertical fin and was controlled by movements of the operator. It takes a good deal of wind to get it off, but is all the better for that in the air for a beginner, because of its inertia. We have been using it on a fairly steep slope and each operator, as he took the landing bump with set teeth, wished ardently for the power to increase the lift co-efficient if only for the last two seconds.

"We get just sufficient time in the air to make us hate the idea of coming to earth, and long to open a throttle and soar over the hills; it is tantalizing when we know the opportunities that exist in United States and other countries for extended flights, but we get a lot of fun out of it, and some instruction; no doubt the time will soon be in Australia when aeroplanes in the air will be a common sight instead of one for all hands to stand and gaze at as at present.



Some of the Victoria Club members and close view of the glider



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

Sergeant (drilling awkward squad)—"Company! Attention company, lift up your left leg and hold it straight out in front of you!"

One of the squad held up his right leg by mistake. This brought his right-hand companion's left leg and his own right leg close together. The officer, seeing this, exclaimed angrily:

"And who is that blooming galoot over there holding up both legs?"—*Chicago News.*

"Pa, what are seasoned troops?"

"Those that have 'pep' and 'ginger' in 'em, I suppose, my son."—*Boston Transcript.*

Knicker—What is the German strategy?

Bocker—When in doubt take Riga.—*New York Sun.*

The Pilot's Lament

I wish I had a Spad again,
I'd be a care-free lad again,
  And brave the boundless ether.
But now they've given me a 'bus
Which haunts my soul—'twas ever thus!
  It hardly holds together!

I shiver in the dizzy heights,
Surrounded by a maze of sights,
  And bolts and infinitem;
And if I meet some Hun machines
I'm jolly sure they'll give me beans,
  For I can never fight 'em!

I dare not do the "stunts" of yore,
When rustics at the cottage door
  Gazed up at me in wonder.
And if I try to loop the loop,
'Twill land me fairly in the soup—
  The struts will burst asunder!

The engine makes a hideous row,
And startles many a grazing cow,
  For Babel isn't in it.
The Lewis gun is jammed, of course:
Explosions of momentous force
  May happen any minute!

Through never-ending tracts of cloud,
(Accompanied by curses loud)
  I aimlessly meander.
Until I land, I dare not laugh,
And then I get a fearful strafe
  From every Flight Commander.

Oh, give me back my Spad again,
And I shall not go mad again;
  I know its tricks and habits.
But if I have much more of this
I'll have to give the game a miss
  And take to keeping rabbits!

A Fight

Twelve thousand feet—and the earth below
  Lies like a jewel in the sun:
A speck in the sky—is it friend or foe?
  Observer, stand to your loaded gun.

Nearer it comes and nearer still—
  Is it a friend or a hostile scout?
Nearer and nearer it comes—until
  A burst from its gun dispels all doubt.

Once the machine gun stutters—again,
  As the craft attacked now makes a stand;
Then—the sickening plunge of the hostile 'plane,
  As the lever falls from a nerveless hand.

A whirling dive, twelve thousand feet,
  A cloud of smoke from the tanks afire;
And—all that tells of a swift defeat
  Is a twisted wreckage of steel and wire.

The Seaplane Scout

"When the Wind is in the West."

I know a little seaplane
That roves the turquoise valut,
In all its dainty, sylph-like form
No man can find a fault;
It soars aloft! It scours the sky!
(My heart flies in its train).
I long to mount upon those wings—
That longing is but vain.
Oh, seaplane dear, I love to watch you skim the wavelet's crest,
Then take your native element 'mid zephyrs from the West!

"When the Wind is in the East."

I know a little seaplane,
It moans 'mong many a cloud,
And when I hear its taunting note
I nearly groan aloud:
"Oh, there's that hateful thing again!"
(I fear my tone's abrupt,
I'm filled with spite and envy, and
My speech becomes corrupt);
" 'Tis just a single-seater; nasty, selfish little beast!"
Oh, seaplane, I've said that to-day—*the wind is in the East.*
[The "infinite variety" of present meteorological conditions must be held responsible for this.—F. E. B.]



WAR NOTE

IN THE EARLY HOURS OF THE MORNING ONE OF OUR AERIAL SCOUTS SUCCEEDED IN OCCUPYING SEVERAL PROMINENT POSITIONS ON THE ENEMY'S FRONT. HE WAS FINALLY FORCED TO RETREAT, BUT SUCCEEDED IN HARASSING THE ENEMY. (*Dotted lines show strategic moves used by Brigadier Fly in the above engagement.*)

Courtesy Life

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(*Continued from page* 154)

ler bearings. (See General Motors Truck Company's Drawing C for rear wheels.) (See General Motors Truck Company's Drawing C-6476 for front wheels.)

Tires—Goodyear straight-side, cord-construction shoes with all weather treads on both front and rear wheels. Fronts, 35 by 5, pneumatic. Rear, 38 by 7, pneumatic.

Rims—Front tires on Kelsey demountable rims as shown by General Motors Truck Company's Drawing No. C.

Rear tires as shown by General Motors Company's Drawing No. C.

Frame—Open hearth, pressed steel, heat treated. Material is specified within close limits and carefully checked by chemical analysis and physical tests. Side members are 5 in. deep by 3 in. wide, just back of the driver's seat, at point where greatest stress occurs.

Steering Gear—Screw-and-nut type, fully inclosed and lubricated. Fore-and-aft steer. Left-hand drive. Inclined column. Large leverage with 18 in. hand wheel. Spark and throttle levers above steering wheel. Spring connections in steering rod.

Gasolene Tank—A seamless cylinder of pressed steel, positively non-leakable. Located under driver's seat, suspended in a seat riser. Capacity 23 gal. (Shown by General Motors Truck Co. Drawing No. B-4640.) The General Motors Truck Co. is permitted to furnish at its option tank as specified above or an interchangeable tank of practically same dimensions as shown by its drawing C-7174.

Fenders—One-piece heavy pressed steel, rigidly braced at two points, over front wheels. No rear fenders.

Driver's Seat—Wide enough to accommodate four persons. (Shown by General Motors Truck Co. Drawing D-7168.)

Top Over Seat—Similar to quartermasters' design. (Shown by General Motors Truck Co. Drawing D-7167.)

Extension Foot Rest—(As per General Motors Truck Co. Drawing D-7173.)

Equipment—Two oil side lamps, one oil tail lamp, mechanical horn, jack, complete set of tools as per General Motors Truck Co. Drawing A-7208.

Hub Odometer—Dreadnaught type.

Front bumper—Spring type, as per G. M. T. C. Drawing D-6958.

Rear bumper—As per G. M. T. Co. Drawing.

Front tow hook—As per G. M. T. Co. Drawing No. C-7146.

Rear tow hook—As per G. M. T. Co. Drawing.

Radiator Guard—As per G. M. T. Co. Drawing No. X-7171.

Two sills to be attached to chassis frame, from back of driver's seat to rear of frame and two sill angles with six volts, all as per General Motors Truck Co. Drawing No. D-7178. Twenty bolts and twenty bolt plates for attaching body as per General Motors Truck Co. Drawing D-7178.

Price of foregoing chassis, with equipment as shown, chassis painted in prime coat. Two thousand, forty dollars and seventy-two cents ($2,040.72). F. o. b. Pontiac, Mich.

GEORGE O. SQUIER,

Brigadier General, C. S. O.

To Have Aeroplane for Manoeuvres at Plattsburg Camp

Plattsburg.—Colonel Wolf, commander of the officers' training camp, was notified October 1st that an aeroplane would be sent to the camp for the trench warfare manoeuvres of next week, and it is probable that three anti-aircraft guns also will be provided for the mimic war.

Rifle practice on the new range has begun, the New England regiment shooting during the forenoon and the New York regiment in the afternoon.

A request was received at the camp from the Secretary of the Treasury for the men of the camp to invest as liberally as possible in the Liberty Loan. Colonel Wolf addressed the students at retreat recently on the subject and committees will be appointed in each company to push the sale of bonds.

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of Aerial Age Weekly, published weekly, at New York, N. Y., for October 1, 1917. State of New York, County of New York, ss. Before me, a notary public, in and for the State and county aforesaid, personally appeared G. Douglas Wardrop, who, having been duly sworn according to law, deposes and says that he is the business manager of the Aerial Age Weekly, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Aerial Age Co., Inc., 280 Madison Avenue, New York; Editor, G. Douglas Wardrop, 280 Madison Avenue, New York; Managing Editor, G. Douglas Wardrop, 280 Madison Avenue, New York; Business Managers, G. Douglas Wardrop, 280 Madison Avenue, New York; Geo. A. Cavanagh, 280 Madison Avenue, New York. 2. That the owners are: (give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.): Aerial Age Co., Inc., 280 Madison Avenue, New York; Henry Woodhouse, 297 Madison Avenue, New York; G. Douglas Wardrop, 280 Madison Avenue, New York. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.): None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is. (This information is required from daily publications only.) G. Douglas Wardrop, Business Manager. Sworn to and subscribed before me this 28th day of September, 1917. Daniel F. Nugent, Notary Public, Queens County, Certificate filed in N. Y. Co. 67. (My commission expires March 30, 1919.)

AERIAL AGE WEEKLY

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A National Army Encampment As Seen From An Aeroplane

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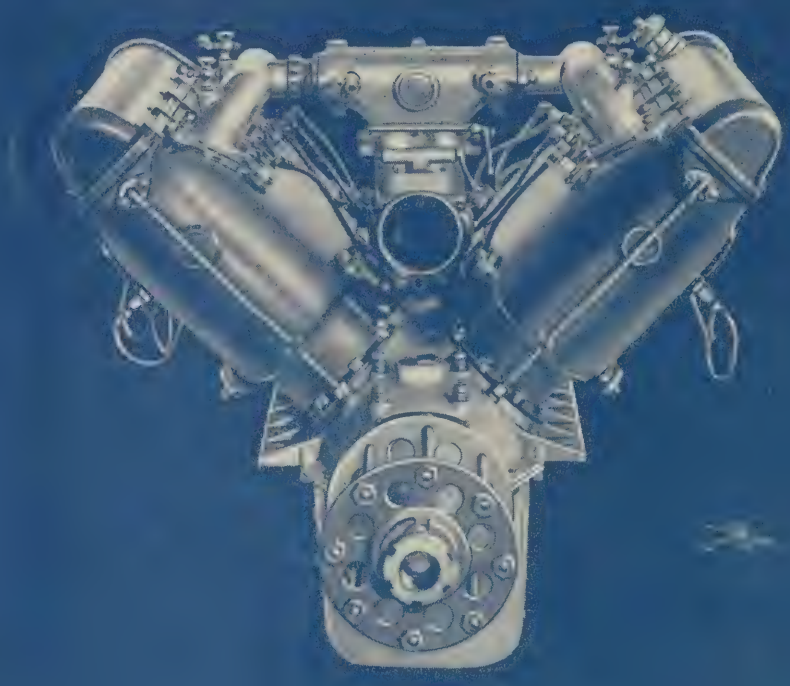
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Progress on Aviation Program Providing for More Than 20,000 Aeroplanes Reviewed by Secretary Baker

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THE TRADE AUTHORITY

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PROGRESS ON AVIATION PROGRAM PROVIDING FOR MORE THAN 20,000 MACHINES REVIEWED BY MR. BAKER

THE Secretary of War authorized the following statement:

The development of the "Liberty motor" is being followed by highly satisfactory progress in the equipment of the aerial branch of the Army and the training of its aviators. While it is inexpedient to impart information of military value or to detail strategic plans, it is felt that a partial announcement may be made of the progress of the aviation program. This statement is to meet numerous requests of the press and to convey to the country an authentic report of the work of the Aviation Section.

Summary of Situation

The aviation situation today may be summarized as follows:

Contracts have been let and work is in progress on practically the entire number of aeroplanes and motors for which provision was made in the $640,000,000 aviation bill passed by Congress in July. This program called for more than 20,000 aeroplanes.

The types of aeroplanes now in process of manufacture cover the entire range of training machines, light high-speed fighting machines, and powerful battle and bombing planes of the heaviest design. Our contracts call for an ample number of training machines and embrace as well giant battle planes capable of the work of the Caproni, the Handley Page, and similar types.

Equipment to Be Ample

Every measure of insurance has been taken that the American forces in France shall be amply equipped with aircraft. The work of the Aviation Section has been thoroughly systematized. The training of aviators, the building of motors, and the construction of wings is proceeding uniformly—each keeping pace with the other and with general war plans.

The comprehensive plan is that, when motors are ready, there shall be ready also the planes necessary; and, when the motors and planes are ready, aviators and machine guns shall be available. Co-ordination has been developed in every branch of the Aviation Section.

Within a reasonable time, considering the period for preparation, this country will send its first aeroplane to Europe. This aeroplane, from the tip of its propellers to the engine, machine gun, and camera, will have been made in the United States.

Great Expansion Necessary

It has been necessary greatly to develop and expand the aircraft industry in this country. This work of increasing the output of existing manufacturing establishments, creating new plants, and providing tool, gauge, and jig equipment for great quantity production, has required time, and the months of the summer have been, and the early fall will be, devoted to this essential groundwork.

United States aeroplanes are being constructed both in this country and abroad. Approximately one-fourth of the number soon needed will be made abroad.

Provision has been made also for the manufacture of the many accessories necessary to aircraft service at the front. Sources of supply for machine guns, observation apparatus, cameras, scientific instruments of navigation and precision, and many other specialties of the aircraft art have been provided. Both in this country and abroad this work has been under direction of skilled men.

Allies Ask for "Liberty Motor" Samples

The designing of the "Liberty motor," previously referred to by the Secretary of War as probably the greatest single achievement of the war, has been accorded foreign recognition. Our allies have already asked for samples of these motors and are investigating the possibilities of quantity production in this country.

The United States today is in practical control of many of the materials required for the manufacture of air craft both for this Government and its allies. Steps have been taken for the conservation and distribution of such materials and the great resources of this country.

Under the direction of the aircraft production board there is being accomplished an international standardization in the tests of materials and their specifications, so that through a unification of the demands upon this country there may be full utility of our resources.

If the operations of the land forces of the country are directed by a general staff, the Aviation Service may lay claim to an "international general staff." More than 30 of the air-service experts of the allied nations have come to Washington and are on regular duty with the officers of the Army and Navy air services and with the members of the aircraft production board. The best men of the air services of the allied countries have been loaned to this Government and were sent here to aid in getting our aviation program under way with the fewest possible mistakes and the greatest economy in time.

There has been a remarkably gratifying response to the call for aviators. This country has an unlimited supply of young men possessing courage, self-reliance, good judgment, and decision, the things required in the air service. This service, appealing to both the imagination and patriotism of such young men, is today fitting thousands of Americans for flying.

Flying Schools

The ground schools conducted by several of our great universities are turning out cadets steadily. Twenty-four flying schools have been authorized and construction work is up to schedule.

Realizing there would be a shortage in the beginning of American-built training planes, a successful substitute plan was evolved. Arrangement was made with the allied countries for the acceptance of our cadet students for final training upon foreign soil. These men are being trained in our uniforms and will be turned over as finished aviators to the fighting forces in France. American aviators are today in training in all the allied countries. They are now undergoing intensive training behind several of the battle fronts. The sending of great numbers of American aviators abroad and the rapidity of training preparations at the flying schools in the United States—such as the one near Dayton—indicates the scope of the work of the Aviation Section since funds were made available for an army of aviators.

SUBSCRIBE TO THE LIBERTY LOAN TODAY.

No Time Lost in Experiments

There is practically no limit to the number of aerial fighters which the United States can and will furnish in the war for democracy. No time has been lost in experiments. The machines which have already proved successful will be reproduced in large numbers in this country. Through negotiations consummated through the Aircraft Board, there has been established the principle of the free interchange of manufacturing and patent rights. There exists today the closest co-operation among the allied nations in sending a great aerial fleet above the battle fronts. When this Nation's Army moves up to participate in the fighting the eyes of her army will be ready.

"The Signal Corps and its staff of foreign advisers are well satisfied with the progress made since the designing of the 'Liberty Motor.' It is not possible to make public the details of the work accomplished. The War Department can only say that its earlier expectations and hopes for the consummation of our extensive aircraft program are being more than realized."

Act Creating Aircraft Board Signed by President Wilson

The act creating the Aircraft Board which has been signed by President Wilson on October 1st, reads as follows

An Act to Create the Aircraft Board and Provide for its maintenance.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of expanding and coordinating the industrial activities relating to aircraft, or parts of aircraft, produced for any purpose in the United States, and to facilitate generally the development of air service, a board is hereby created, to be known as the Aircraft Board, hereinafter referred to as the board.

Sec. 2. That the board shall number not more than nine in all, and shall include a civilian chairman, the Chief Signal Officer of the Army, and two other officers of the Army, to be appointed by the Secretary of War; The Chief Constructor of the Navy and two other officers of the Navy, to be appointed by the Secretary of the Navy; and two additional civilian members. The chairman and civilian members shall be appointed by the President, by and with the advice and consent of the Senate.

Sec. 3. That said board and tenure of office of the members thereof shall continue during the pleasure of the President, but not longer than six months after the present war. The civilian members of the board shall serve without compensation.

Sec. 4. That the board is hereby empowered, under the direction and control of and as authorized by the Secretary of War and the Secretary of the Navy, respectively, on behalf of the Departments of War and Navy, to supervise and direct, in accordance with the requirements prescribed or approved by the respective departments, the purchase, production, and manufacture of aircraft, engines, and all ordnance and instruments used in connection therewith and accessories and materials therefor, including the purchase, lease, acquisition, or construction of plants for the manufacture of aircraft engines, and accessories: *Provided,* That the board may make recommendations as to contracts and their distribution in connection with the foregoing, but every contract shall be made by the already constituted authorities of the respective departments.

Sec. 5. That the board is also empowered to employ, either in the District of Columbia or elsewhere, such clerks and other employees as may be necessary to the conduct of its business, including such technical experts and advisers as may be found necessary, and to fix their salaries. Such salaries shall conform to those usually paid by the Government for similar service: *Provided,* That by unanimous approval of the board higher compensation may be paid to technical experts and advisers. The board may rent suitable offices in the District of Columbia or elsewhere, purchase necessary office equipment and supplies, including scientific publications and printing, and may incur necessary administrative and contingent expenses, and for all of the expenses enumerated in the paragraph there shall be allotted by the Chief Signal Officer of the Army for the fiscal year nineteen hundred and seventeen and nineteen hundred and eighteen the sum of $100,000, or so much thereof as shall be necessary, from any appropriation now existing for or hereinafter made to the Signal Corps of the Army, and such appropriation is hereby made available for these purposes: *Provided further,* That except upon the joint and concurrent approval of the Secretary of War, and the Secretary of the Navy there shall not be established or maintained under the board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval services: *Provided further,* That a report shall be made to Congress on the first day of each regular session of the salaries paid from this appropriation to clerks and employees by grades, and the number in each grade.

Flights Across Atlantic May Soon Be Accomplished, Says Mr. Coffin

The Philadelphia *Inquirer* prints the following:

The great hydroaeroplane now being constructed in the United States for one of the Allies may be expected to make the flight across the Atlantic from this country at no very distant day.

This statement, made by Howard Coffin, of the Aircraft Production Board, promises a feat the accomplishment of which will make the tales of Jules Verne seem prosaic.

There have been rumors recently that the Italians would attempt to make the flight from the United States to England in the large Caproni triplanes.

Mr. Coffin said that it was probable that before any such attempt was made by the Italians, aviators of another government would make the flight in giant hydroaeroplanes being constructed in this country for use by that government.

The hydroaeroplane now in course of construction, however, Mr. Coffin said, will be fitted for service on the surface of the sea as well as for flight through the air and could descend with perfect ease and safety under normal conditions at sea.

Every Day Emphasizes the Necessity of a Big American Air Fleet

(Editorial in *N. Y. American*)

EVERY German air raid upon London emphasizes the necessity of hurrying a big American air fleet to the war zone. It becomes more and more apparent that the one certain way to force the enemy to accept the President's peace conditions is to attack him energetically from the air, and to keep on attacking him till he realizes the futility of longer holding out.

Had there been a big American air fleet in England or southern Belgium Monday the attack by German aeroplanes upon England could not have happened.

In fact, a great air fleet not only would prevent the Germans from attacking across the water, but would actually drive them from the bases from which they have been conducting both air and submarine raids, to the peril of the commerce of America and her allies.

This newspaper pioneered the movement for a great air fleet. It used its whole influence toward persuading Congress to provide the money for an aerial fighting force. And it has sought in every way to call public attention to the work that is being done by the Signal Corps of the army under General Squier, and to the Air Craft Production Board, headed by Howard E. Coffin, and speeding up the important work of aeroplane construction.

Even in time of war no great and effective work can be accomplished without the enthusiastic approval of the people. It is of the greatest value to the men engaged in making ready our overhead army that the people should know what they are doing, how they are doing it, and feel an abiding confidence in their efforts.

As soon as the present appropriation for an air fleet is expended, a second (and probably a third) must follow.

An air-fighting establishment cannot be provided without a vast outlay of money. The original cost of the machines is of little importance, compared to the expense of keeping them in fighting condition.

Every time an aeroplane is sent against the enemy there must be a great supply of parts at the base, so that the instant it sustains an injury in battle it can return and be rebuilt for renewed action.

(*Continued on page* 208)

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THE NEWS OF THE WEEK



Goethals New President Wright-Martin Co.

Major Gen. George W. Goethals was elected President of the Wright-Martin Aircraft Corporation at a meeting of the Directors Oct. 3. He will take at once an active part in directing the corporation's affairs. Since his retirement as General Manager of the Shipping Board, General Goethals has been engaged chiefly in undertakings of his engineering firm, Goethals, Jamieson, Houston & Jay, 40 Wall Street. As head of the aeroplane company he will continue to act in an advisory capacity on projects in which his firm is interested.

General Goethals's election as a Director of the Wright-Martin Corporation occurred at the annual meeting of shareholders before the Directors met. When the other Directors decided to make him President he accepted with this statement:

"I have seriously considered and discussed my acceptance of the position to which you have elected me, and I have accepted it with the view of doing some work that will be useful and assist in the prosecution of the war. My acceptance is from a sense of duty, and for such time as I can be helpful, or during the war period."

J. F. Alvord retired from the Presidency to make way for General Goethals. George H. Houston, a partner of General Goethals, is to continue as Vice President and General Manager of the Wright-Martin Corporation. Marshall J. Dodge of Bertron, Griscom & Co., was elected a Director, and the retiring members were re-elected for another year.

The Wright-Martin Corporation recently obtained a large order from the Government for Hispano-Suiza aeroplane motors. The output of the Wright-Martin plant at New Brunswick, N. J., is to supplement the Government's production of Liberty motors to equip the aeroplanes now in process of construction.

The annual statement said that as soon as the last of the motors was completed, which would be in a few weeks, the full plant capacity was to be devoted to United States Government work.

Castor Oil as a Motor Lubricant

The Casto bean comes mainly from India, but Britain monopolizes that source of supply for her own air fleets. The Council of National Defense and the Department of Agriculture are expecting that the crop that is produced by the United States this year will be largely augmented in 1918.—(Extract from Nation's Business.)

Flies 140 Miles an Hour

According to a dispatch received at Washington, October 1 from Rome, Sergeant Stoppani, of the Royal Italian Flying Corps, maintained an average speed of 140 miles an hour in a flight from Turin to Rome.

The dispatch states that the flight was without incident throughout the 400 miles of the journey, this in spite of heavy winds which blew all of the way.

London Warmly Greet U. S. Flyers

At this particular juncture, when the public mind is occupied by aerial raids and proposed reprisals, Londoners are warmly greeting numbers of American naval officer aviators, dressed in khaki, who are to be seen on London streets. Many are university students.

Added interest attaches to the aviators owing to the fact that recently there has been much newspaper discussion concerning the American air preparations. Frequently the Americans are hailed on the streets with such remarks as "We're glad to see you."

Wright Aviation Field Leased

The following statement is authorized by the aircraft production board of the Council of National Defense:

To centralize engineering and experimental work in connection with the Federal aircraft program the Wright Field, at North Dayton, Ohio, has been leased for three years by the United States Government for a temporary central engineering and experimental field. This site was selected because of its immediate availablity, its central location geographically, and its proximity to Wilbur Wright Field.

The field will hereafter be known as McCook Field, in honor of the "Fighting McCooks," to whom the property belonged until recently. Offices, machine shops, hangars, and barracks will be erected immediately. The field will be under command of Lieut. Col. Clark, of the Equipment Division of the Signal Corps, assisted by Maj. Vincent and Capt. Marmon.

J. N. Willys Chairman Camp Recreation Fund Committee

John N. Willys, of Toledo, automobile and aeroplane manufacturer, has been appointed chairman of the national committee on war camp community recreation fund, it is announced. The committee will have charge of the national campaign to raise a fund of "three dollars for each soldier and sailor" to provide hospitality and wholesome recreation for the enlisted men in the communities adjacent to the training camps, under the direction of the War Department and Navy Department commissions on training camp activities.

President Wilson has written to Mr. Willys, expressing his appreciation of the acceptance of this patriotic service. The President says:

"My Dear Mr. Willys: Mr. Fosdick tells me that you have agreed to accept the chairmanship of the war camp community recreation fund, and I am writing to express my appreciation of your willingness to serve, as well as my hope that the work of you and your colleagues may meet with every success.

"Cordially and sincerely yours,

"Woodrow Wilson."

Electric Wonders of War Will be Shown

"Electricity in War" will be the great feature of this year's Electrical Exposition at Grand Central Palace. The Government will have a wonderful exhibition.

The principal exhibit of the War Department will be that of the Signal Corps. It has been prepared under the direction of Major Henry Opdycke, signal officer of the Eastern Department. It will embody much of the modern apparatus for communicating in the war areas, including the new trench telephone sets to be employed by our troops in Europe. The various wireless sets, particularly those used in communicating with aircraft, will be interesting features.

The navy employs electricity so extensively on board ship that its exhibit will be quite comprehensive. The Census Department will have a fully equipped bureau showing how the hundred million people in this country are listed and indexed.

Aero Motor Order for Westinghouse

An order for a considerable number of aeroplane engines has been awarded by the Aircraft Production Board to the Westinghouse Electric and Manufacturing Company. The order has a total value of $17,500,000. A new plant is to be erected at Swissdale, Pa., where the engines are to be produced at the rate of 600 a month.

Details relative to the type of motor to be manufactured by the Westinghouse interests are being withheld.

Aerial Unit Disbands to Get Commissions

Aerial Coast Patrol Unit 3, which has been training at Smiths Point and Mastic on the south shore of Long Island for five months is disbanding to go into government schools to train for commissions.

During the summer there have been thirty-two college men, including many athletes, connected with the corps, which consisted of three divisions.

Practically all the members are enrolled in the Naval Reserve Flying Corps, and undertook to train themselves because the navy lacked the necessary schools and equipment.

They bought twelve flying boats and hydro-aeroplanes with their own funds and paid for the hangars and their own instructors.

Army Aircraft Board Sees Fliers in Action

Newport News, Va.—The Aircraft Production Board visited Langley Aviation Field Oct. 4, near this city, witnessed flights by Italian, French and American fliers and collected data on the most modern machines of the three Governments.



Major General George W. Goethals, the newly elected president of the Wright-Martin Aircraft Corporation.

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Major Bishop Hero of Many Combats

The greatest living air fighter, now that Guynemer is dead, and a man whose record during the time that he has been fighting has even exceeded that of the Ace of Aces, was New York's guest for a few hours last week, and it is safe to say that not one of the thousands who saw his coming and goings suspected his heroic qualities. The clerk at the big hotel where he was staying nearly lost his lower jaw when he found out who was who. The few who were introduced could hardly believe their eyes.

The hero is Major W. A. Bishop, of the Royal Flying Corps. Here is his record, piled up in five months:

One hundred and ten single combats with German flyers.

Forty-seven German planes sent crashing to earth.

Twenty-three other 'planes sent down, but under conditions which made it impossible to know certainly that they and their pilots had been destroyed.

Thrilling escapes without number, including one fall of 4,000 feet with his machine in flames.

The most dare-devil air feat of the war—an attack single-handed on a Boche airdrome, in which he got three machines in a few minutes.

The winning in three months of every military decoration which Britain has to bestow. So far as can be learned he is the only man living who has them all—Victoria Cross, Distinguished Service Order and Military Medal.

Further Tests of Side-by-Side Tractor

A new type of training biplane which permits the instructor and student to sit side by side and intended to cut down the time required to train aviations, was tested on October at Central Park, Long Island.

Messrs. Alan R. Hawley, President Aero Club of America; Henry Woodhouse, Mrs. J. K. Harbeck, wife of the President of the Duesenberg Motors Corporation; Mrs. N. G. Rost. Mrs R. W. Wadman and Mr. Walter H. Phipps made flights with Mr. Bert B. Acosta, who is one of the Army instructors at Mineola.

The machine which is equipped with a 4-cylinder 100-h.p. Duesenberg motor was built by the Ordnance Engineering Company. Messrs. Hawley, Woodhouse and other authorities praised it as an exceptional easy flyer, being extremely easy to operate and efficient in every way. The test was attended by a number of military officers.

Among the civilians who witnessed the tests were: Mr. and Mrs. J. R. Harbeck, President Duesenberg Motors Corporation; Mr. and Mrs. Chas. Stollberg, Vice President Duesenberg Motors Corporation; Mr. and Mrs. N. G. Rost, General Sales Manager Duesenberg Motors Corporation; Mr. E. P. Decker, Assistant to President Duesenberg Motors Corporation; Mr. and Mrs. Rex W. Wadman, handling Duesenberg advertising; Mr. E. R. Michie, Ordnance Engineering Co.; Mr. Walter Phipps, designer; Mr. Alan Hawley and Mr. Henry Woodhouse.

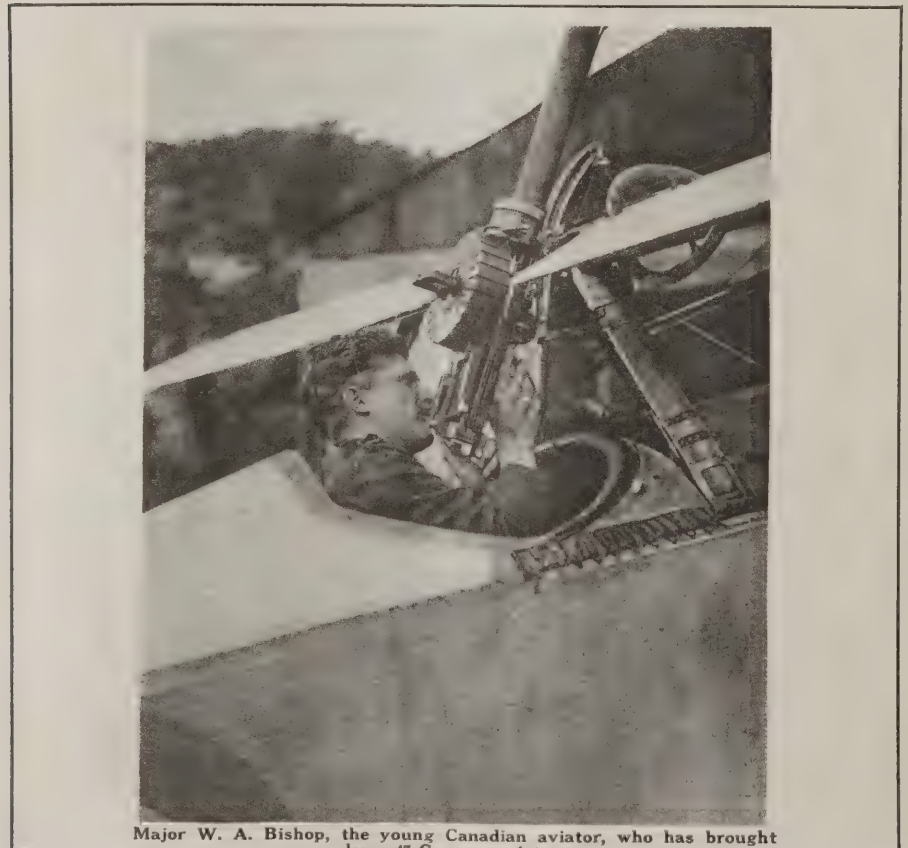


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Flight-Lieut. S. G. Campuzano, the intrepid young Cuban aviator, who has been decorated by two of the Allies.

Care T. Batts Loops

On September 30th Care T. Batts loops-the-loop 120 times at Newport News, using a Curtiss tractor biplane.



Major W. A. Bishop, the young Canadian aviator, who has brought down 47 German aviators

Propeller Maker Moves to Grand Rapids

Grand Rapids.—The Flottorp Mfg. Co. of Chicago, manufacturer of aeroplanes, will move to this city. The company will operate a large plant here and expects to turn out 100 propellers a day within the next 30 days. The company has been established for six years in Chicago. O. Flottorp is president, W. H. Gardner is vice-president and treasurer.

S. A. E. Winter Meetings

Definite arrangements have been completed by the Meetings Committee of the Society of Automotive Engineers for the Winter Meetings of the Society in New York during Automobile Show Week and in Chicago during the Chicago Show Week. The plans are such that the meetings should be of greater importance than previous years.

The New York Dinner will be held at Hotel Biltmore, Thursday evening, January 10th. January 10th has been named S. A. E. day for the New York Show Week by Samuel Miles, general manager of the Show.

The War Dinner of the S. A. E. to be held at Chicago during the Chicago Show Week will be held at Hotel LaSalle on Friday evening, February 1st. It will be a popular priced dinner at $3.00 per person and accommodation for 1,000 will be provided.

During the day of Friday, February 1st, there will be held a Professional Session which will largely be devoted to reading of papers on tractor design and other questions relating to the tractor industry.

Mysterious Power Machine May Get Test by United States

The House bill providing for tests of the mysterious machine for utilizing free energy devised by Garabed T. K. Giragossian, an American inventor from Boston, went to the Senate October 4th, and congressmen who are enthusiastic over the war possibilities of the machine planned a drive for immediate action.

Giragossian so impressed five members of the House patents committee at a secret demonstration that he had perfected a marvelous energy machine without boiler, fuel, motor or other accessories that they recommended the passage of the bill to provide for a demonstration before a board of five scientists and the Secretary of the Interior, as a preliminary to the government securing the rights to use the device.

Former Speaker Cannon, who, in the face of ridicule, years ago forced through the resolution for testing Prof. Langley's flying machine supported this resolution in the House strenuously.

In an interview with Mr. Giragossian he makes the claim that one of his free-energy generators, built at the same expense as a good cooking stove, can supply five ordinary families with sufficient heat, light, and energy for domestic purposes without expense.

He also claims that by the use of the free-energy generator our largest ships can be made to travel over 100 knots an hour, without expense for motive power.

By this new agent, aerial navigation, it is said, will be made a greater success and the mastery of the air accomplished.

Mr. Giragossian says: "In order to form an idea of the Garabed we have to imagine a working engine the motive power of which is not steam, but something else that can be obtained freely. The size of this motor and the quality of energy to be produced by it is dependent upon our will and enterprise. It can be manufactured with less expense and occupies less space and is very much lighter than the steam engine, with its numerous appliances. It is portable, and can be placed and put into operation wherever there exists a spark of human life. He claims: "That in an area not larger than Boston Common (48 acres) sufficient power can be produced under the new system to supply the wants of the whole industrial world."

"Temperature, place, and the time will have no effect on the action of the Garabed. It can work with equal advantage in the Arctic or the Torrid Zone; it can work without human assistance, automatically, ceaselessly, by day and by night, and at no cost except for the usual depreciation of machinery."

"The Garabed possesses all the requisite and necessary qualities for the successful conquest of the air. It can supply the airship with an immense quantity—tens of thousands of horse-power or as much as necessary. The airmen will be able to encircle the globe as many times as he pleases without descending to the ground on account of the scarcity of energy. The abundance of energy will make possible the equipping of aircraft with huge and powerful gyroscopes to assist its stability. Furthermore, there is said to be already the possibility of lifting substances from the ground by electricity, neutralizing or counteracting gravity. It will therefore be not altogether visionary to hope that the airship may be floated aloft by electrical means." Mr. Giragossian states that immediately after the bill, which has passed the House and the Senate, protecting his invention becomes a law he will proceed to Boston and give a demonstration to a com-

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mittee of scientists, who will have been appointed to investigate and pass upon his free-energy generator.

Senate passed House bill providing for tests of the Garabed invention late afternoon Oct. 4th.

Model Balloon Here From Italy Rivals Zeppelin

Bringing a model of a dirigible balloon the marvelous performances of which, it is believed, will cast the Zeppelins into the discard altogether and be a great factor in bringing the war to an end, Lieutenant Luigi Crescentini, a civil engineer connected with the Italian Aviation Corps, arrived at an Atlantic port recently to discuss the future of the new airship with the American army and navy authorities.

"I am not at liberty to disclose the details of the new Ferlanini dirigible," said Lieutenant Crescentini, "but I may say that it is shaped somewhat like a dolphin; 360 feet in length and is capable of going at the rate of fifty to sixty miles an hour at an altitude of 5,600 meters. This is more than fourteen hundred meters higher than the Zeppelins can rise.

"The Ferlanini dirigible can carry, in addition to its crew, four tons of bombs. Without so ponderous and space-occupying a cargo, it can easily carry fifty passengers."

Search for Aeroplane Fuel

Washington.—Hundreds of schemes for extracting a higher quality of gasolene from petroleum, and scores of samples of products for which the inventors claim superiority, have been submitted to the Federal Bureau of Mines as a result of an appeal for research to develop a better fuel for aeroplane engines. About thirty samples have been tested by experts of the Bureau and all were reported no better than ordinary high-grade gasolene. About ten remain to be investigated.

Despite the discouraging record, the Bureau is glad to receive other samples or to investigate new processes in the hope that a valuable discovery may yet be made.

Aviation Certificates granted during the week Ending Oct. 6

854 Thomas Harris.
855 Frank D. Sinclair.
856 Miles E. Kellin.
857 Leo R. Bourdon.
858 Allen P. Bourdon.
859 Brayton Nichols.
860 Robert T. Jefferson.

Liberty Motor on Test in Vacuum Chamber

One of the most interesting of all developments in connection with activites by the Government in the production of the new U. S. aeroplane is a small building at the Bureau of Standards grounds in which is a vacuum chamber for the testing of aeroplane engines at atmospheric conditons ranging from that found at sea level to that found at an altitude of 20,000 or more feet. In this chamber the engine can be started at sea level and "fly" as high as need be for observation purposes, and it can "land" as quickly or as slowly as desired.

The chamber is 6 by 6½ by 15 ft., with walls 12 in. thick, made of concrete and reinforced with steel, and not only is the reduction of pressure arranged for, but provision made to care for the exhaust of the engine. Provision also has been made for the heat produced by the engine which, in the open upper sky, would be dissipated. There is a mounting similar to that for an aeroplane, and the air left in the chamber is kept in rapid motion when tests are on.

One end of the chamber has big refrigeration coils, filled with ammonia, and five big fans provide the circulation. Openings in the side were made necessary for passage through them of water, ammonia, thermometer, pressure gages, and other devices. A shaft runs through a stuffing box to the outside to connect with an electric dynamometer, to observe the power up to 450 h.p. The compartment is lined with cork, and the air that supplies the chamber must be brought in at a temperature to correspond with zero Fahr., which aviators find 20,000 ft. above the ground.

Surroundings the chamber is the stucco structure, 24 by 50 ft., containing the ammonia refrigertaing plant, an exhaust blower with a capacity of 1,500 cu. ft. a minute, weighing devices, measuring arrangements for estimating water and heat, including the heat which escapes in the water, the heat which escapes in exhaust gases, and also the heat that leaves the engine in the circulating air around it; also for gauging the temperatures of air and water, for indicating the pressure of the air in the vacuum chamber, the volume of air used to supply the engine, the power and speed generated, and various other factors.

Doors leading into the chamber weigh 500 lbs. each, and they are made so the covering will fall off in case of an explosion, that the chamber may not be wrecked. For observing the test, port holes, covered with glass an inch thick, are provided.

THE WORK OF ORVILLE WRIGHT

MEN say that the war must be won in the air, as if the idea were something new. But to Orville Wright it is not new.

Back in 1906 he and his brother Wilbur, now dead, planned the victory which must come soon.

On his front porch today he told of the vision of a lasting world peace that quickened their minds and guided their hands as he and his brother worked on their flying machine, which, as they planned, was to put an end to wars.

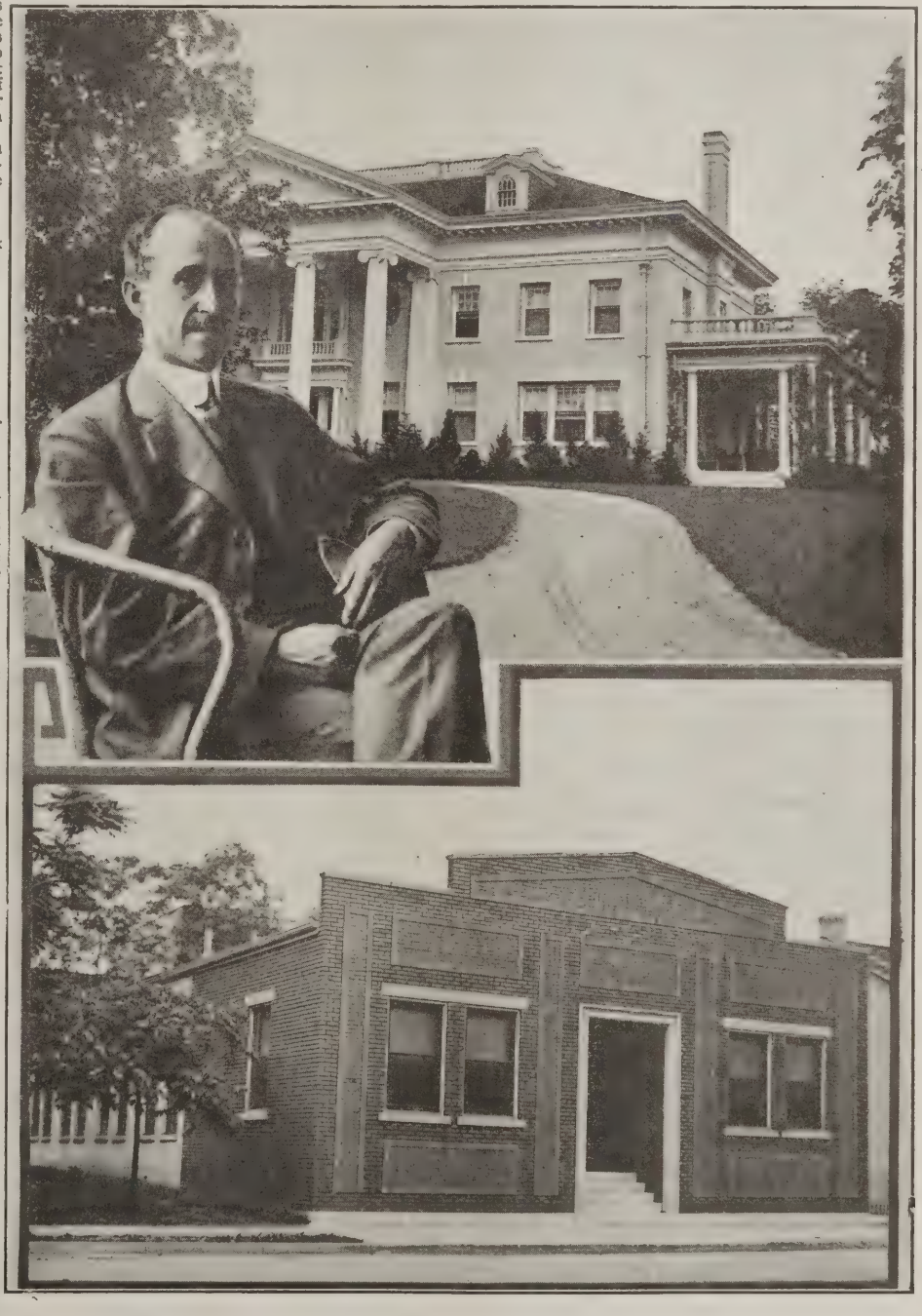
Not to win wars, but to win peace, they dreamed. And as they dreamed so it will come to pass. Of that he is certain. Because he says this is the last war.

For if the war is to be won in the air, as it must be, then it is to Orville Wright and his brother, Wilbur, to whom the world will build its grateful memorials.

"In your early experiments did you think of the aeroplane as a thing that would some time be a determining factor in war?"

"We always thought of it as an instrument for the making of permanent peace," said Wright. "That idea was constantly before us to inspire us. We never let it out of our sight. From the start we saw in it an unerring scout through which armies could detect each others movements. An army movement can be successful only if veiled in the strictest secrecy. We saw that the aeroplane would give eyes to armies and the armies with the most eyes would win the war. We saw that when nations came to recognize what we saw, wars would end. And what we foresaw then is coming true now. The nation with the most eyes will win the war and put an end to war. That is what we planned and that is what will happen."

Thus spoke Orville Wright, who is Dayton's idol. Ask anyone how to get to Wright's home and they will reply, "Take the Oakwood car and get off at Harmon Avenue and walk two squares to the right until you come to the big white house on the hill." And then you ask where Wright's workshop is. You are told at once to take a Third Street car and get off at Broadway, and that you will find Wright's shop "right behind the jewelry store on the corner."



The Orville Wright mansion at Dayton, Ohio; Orville Wright, and the Orville Wright experimental laboratory where the pioneer is now doing some immensely important work.

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NAVAL and MILITARY AERONAUTICS

To Remove Age Limits for Officers Reserve Corps

A bill urged by the War Department to remove the age limits in the lower grades of the Officers' Reserve Corps was passed by the House, October 2nd. There are over 150 candidates who have satisfactorily completed the aviation course who are over age for Lieutenants' commissions while 2,000 others will be ready in three months for commissions.

The Department estimates that the bill would effect a saving in pay of $1,500,000 a year.

Army Aeronautics

Paragraph 9, Special Orders, No. 138, June 15, 1917, War Department, is amended so as to detail the following-named officers in the Aviation Section, Signal Corps, and rate them as junior military aviators from the dates set after their respective names: First Lieuts. Clinton W. Russell, Infantry, October 14, 1916; Millard F. Harmon, jr., Infantry, October 15, 1916; Maxwell Kirby, Cavalry, October 15, 1916; Howard D. Davidson, Infantry, October 16, 1916; and Davenport Johnson, Infantry, October 16, 1916.

First Lieuts. Frank J. Maxwell and Howard O. Walker, Signal Officers' Reserve Corps, are relieved from their present duties and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for assignment to duty in his office.

Maj. Clarence A. Dougherty, National Army, will proceed with the least practicable delay to Camp Taylor, Louisville, Ky., and upon arrival will report to the commanding general, Eighty-fourth Division, for assignment as division signal officer.

First Lieut. George F. Gracey, Medical Reserve Corps, is relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Ind., and will proceed to Hazlehurst Field, Signal Corps Aviation School, Mineola, Long Island, N. Y., and report in person to the commanding officer for duty, and by letter to the commanding general, Eastern Department.

Orders

Orders heretofore issued directing First Lieut. Charles P. Eich, Av. Sec. S. O. R. C. to duty at Camp Kelly, South San Antonio, are changed to duty at Schol of Aeronautics, at Columbus, Ohio.

First Lieut. Robert S. Walton, Sig. Corps, will report to the Chief Signal Officer of the Army for assignment for duty.



Major J. E. C. McDonnell, acting commander of the Chanute Field.

Second Lieut. Arthur Schupp, Sig. Corps, to Chief Signal Officer, for assignment for duty.

Capt. Hobart H. Hawkins, Av. Sec., S. O. R. C., to School of Military Aeronautics at Atlanta, Georgia.

Lieut. Col. William Mitchell, Av. Sec., Sig. Corps, is rated junior aviator from July 19, 1917.

First Lieut. William A. Hoeveler, jr., Av. Sec. S. O. R. C., is assigned to active duty at Hazlehurst Field, Mineola, Long Island, N. Y.

Capt. James A. Buchanan, Av. Sec., S. O. R. C., is assigned to active duty at Camp Kelly, South San Antonio.

Capt. David Gray, Av. Sec. S. O. R. C., active duty and to report to the Chief Signal Officer of Army for assignment?

First Lieuts. Julius C. Tips and William B. Pettus, Av. Sec. S. O. R. C., are detailed as supply officer and disbursing officer, respectively at aviation supply depot at Fort Sam Houston, Texas.

First Lieut. Arthur E. Simonin, Av. Sec. S. O. R. C., has been relieved from duty requiring him to participate regularly and frequently in aerial flights as from Sept. 21, 1917.

Capt. F. Lyman Wells, Av. Sec. S. O. R. C., is assigned to active duty at Massachusetts Institute of Technology, Cambridge, Mass.

First Lieut. Kelling G. Pulliam, Company B, Sig. Corps, relieved from duty at San Diego, Cal., and ordered to proceed to his proper organization.

First Lieut. Fred. B. Rentschler, Sig. Corps, ordered to Chief Signal Officer for assignment.

First Lieut. James C. Mars, Av. Sec. S. O. R. C. is relieved from further active duty (Sept. 28).

Capt. John F. Dulles, S. O. R. C. ordered to aective duty at War College Division, for assignment to Military Intelligence Division.

First Lieut. James A. Parnell, Sig. Offi. Res. Corps, assigned to active duty as assistant to the department signal officer, Central Department, at Chicago, Ill.

First Lieut. Van. B. Rector, S. O. R. C., assigned to duty at Presidio of Monterey, Cal.

Capt. N. R. Jones, Aviation Section O. R. C., to Atlanta, Ga.

Major A. L. Sneed, Signal Corps, to command school of military aeronautics, Massachusetts.

Captain Richard B. Barnitz, Aviation Section, Signal Corps, to San Antonio.

Captain Thomas Walkup, aviation section, Signal Officers' Reserve Corps, to active duty at Memphis, Tenn.

Placed on Aviation Board

Captain David L. Roscoe, Aviation Sec. Sig. Corps, is detailed as member of the board of officers appointed to meet at Toronto, Canada, for the purpose of examining applicants for commission in the Aviation Section of the Signal Officers' Reserve Corps, vice Captain Sheppler W. Fitzgerald, junior military aviator, Sig. Corps, hereby relieved.

First Lieut. C. J. Glidden, Av. Sec. Sig Offi. Res. Corps, is detailed as a member of the board of officers appointed in par. 39, S. O. No. 5 War Dept. Jan. 6, 1917, vice Capt. Frank M. Kennedy, Av. Sec. Sig. Corps, hereby relieved.

The following named officers of the Sig. Offi. Res. Corps, are assigned to active duty as follows: Maj. Edward E. Kelly, First Lieut. Samuel H. Miller, Seward H. Brown, and Clarence E. Cronkite to duty at the Presidio, Cal., Signal Corps training camp.

First Lieuts. Michael Coyle and Van E. Roddey, to Panama Canal Department.

First Lieuts. Benjamin F. Waller, Willis R. Lansford, George F. Shaw, Frank B. Saunders, and John H. Edwards to Camp Alfred Vail, Little Silver, N. J.

First Lieut. Benjamin Schmidt to Camp Samuel F. B. Morse, at Leon Springs, Texas.

First Lieuts. Roy H. Ojers, David M. Sparks, Rue O'Neill, and LeRoy A. Hoss to Signal Corps Training Camp at Fort Leavenworth, Kansas.

Captain Louis S. Scott, Aviation Section, Signal Officers' Reserve Corps, to Mount Clemens, Mich., for assignment to duty.

First Lieutenant Fedor L. Senger, Medical Reserve Corps, to Mineola, L. I., N. Y., and report to the commanding officer, Signal Corps Aviation School, Hazlehurst Field, for duty.

Following named officers, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to commanding officer, Hazlehurst Field, Mineola, L. I., N. Y., for duty:—First Lieutenants Donald Lyle, William F. Goulding, M. E. Carter, Jr.; Martin C. Giesecke, George L. Erwin, Jr.; William M. Russell, Robert E. Townes, Harold Wilder, Ross N. Wetherbee, Henry C. Colburn, Stuart E. Elliott, Harold H. George.

Captain Vivian A. C. Henmon, aviation section, Signal Officers' Reserve Corps to active duty at Syracuse, N. Y.

First Lieutenant Oliver B. Wyman, aviation section, Signal Officers' Reserve Corps, to active duty at Signal Corps aviation school, Camp Kelly, South San Antonio, Texas.

First Lieutenant Dorr Piele, aviation section, Signal Officers' Reserve Corps to active duty at this city and report to chief signal officer of the army.

First Lieutenant Louis F. Schultze, aviation section Signal Officers' Reserve Corps to active duty at Washington, D. C., and reported to chief signal officer of the army.

First Lieutenant Charley B. Ammon, Aviation Section, Signal Officers' Reserve Corps, to active duty at Belleville, Ill., and report to commanding officer, Scott Field, for duty.

Army Aeronautics

The following to Fort Sam Houston, Aviation Section: Capts. C. A. Dunnigan, J. J. McQuillan, C. H. Petton, G. A. Watson, W. J. Petrick, B. L. Meuhress, A. Bloom, G. H. Taylor, W. E. Lansing.

Major S. E. Wolff, to Chief Signal Officer; First Lieut. G. A. Rentschler, to Chief Signal Officer; Major H. R. Harmon, to Aeronautical Officer Southern Dept.; vice Major L. Ferron, relieved; Major T. H. Bane, to Berkeley, Cal., for Temp. duty, then to Millington, Tenn.; Capt. J. F. Kelly, to Kelly Field, South San Antonio; Major J. C. McDonnell, J. M. A., to Mt. Clemens; Jajor W. F. Pearson, to University of Illinois; First Lieut. P. A. Blair, to Mineola; First Lieut. R. S. Walton and Second Lieut. A. Schupp, to Chief Signal Officers; First Lieut. S. McIver, to Mineola; Major A. L. Sneed, to Cambridge; First Lieut. F. B. Rentschler, to Chief Signal Officer; Major D. M. Cheston, Jr., Signal Chief, to Cornell University; Major F. W. Leadbetter, Signal Chief, to report to Chief Signal Officer; First Lieut. B. E. Granger, Signal Chief, to Mineola; Major T. L. Christal, Signal Chief, and Major F. L. Martin, to report to Chief Signal Officer.

First Lieut. Ross D. Long and First Lieut. Ralph H. Kuhns, Medical Reserve Corps to Fort Worth, Texas, and report to commanding officer, Signal Corps Aviation School.

The resignation by First Lieut. Amos C. Lietz, Signal Officers' Reserve Corps, of his commission as an officer in that corps is accepted by the President.

Major John C. McDonnell, junior military aviator, Signal Corps, to Mount Clemens, Mich., and report to commanding officer, Selfridge Field, for assignment to duty.

Captain Joseph F. Kelly, Signal Corps, to Signal Corps training station, Kelly Field, South Antonio, Texas, for assignment to duty.

First Lieut. Harry C. Sigourney, Aviation Section, Signal Officers' Reserve Corps, will report to Chief Signal Officer of the army for duty in connection with aviation personnel.

First Lieut. Horace W. White, Aviation Section, Signal Officers' Reserve Corps, to Toronto, Canada, and report to commanding officer, Aviation Section Signal Corps Detachment, relieving First Lieut. Benni Goldblatt, Aviation Section, Signal Officers' Reserve Corps, who on being thus relieved, will proceed to San Antonio Texas, and report to commanding officer, Camp Kelly, for assignment to duty.

First Lieutenant Charles F. McIntosh, Aviation Section, Signal Officers' Reserve Corps, to active duty at Belleville, Ill., and report to commanding officer, Scott Field, for assignment to duty.

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Captain Willard Dadsworth, Aviation Section, Signal Officers' Reserve Corps, is designated as aeronautical officer, Eastern Department, relieving Lieutenant Colonel John C. Gilmore, Jr., Coast Artillery Corps. Lieut. Colonel Gilmore will proceed to Fort Moultrie, S. C., and assume command of the coast defenses of Charleston.

Sent to Mineola Field

Following named officers, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mineola, Long Island, N. Y., and report to commanding officer, Hazlehurst Field, for duty: First Lieut. William Winter, David S. Seaton.

First Lieut. James E. McKenna, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to chief, War College Division, General Staff, Washington, D. C.

First Lieut Hunter S. Robbins, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mount Clemens, Mich.

First Lieut. William P. White, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mineola, L. I., N. Y., and report to commanding officer, Hazelhurst Field.

First Lieut. John E. Enright, Aviation Section, Signal Officers' Reserve Corps, to active duty at Belleville, Ill.

Captain George L. Jones, Aviation Section, Signal Officers' Reserve Corps, to active duty at Seattle, Wash.

Officers of Aviation Section, S. C., to duty as follows: Major E. V. Summer, Jr., to Richmond, Va.; Majors F. J. Ostermann, H. M. Hickam and F. K. Ross to Mineola, N. Y.; Capts. H. R. Eyerich to Signal Corps Aviation Construction Camp, Morrison, Va.; M. H. Grace to C.G., Eastern Dept., Governors Island, N. Y. (Sept. 22, War D.)

Officers of Aviation Section to duty, Mineola, N. Y.: First Lieuts. R. M. Chambers, H. G. Armstrong, C. N. Deatherage, Jr., G. F. Fisher. (Sept. 22, War D.)

First lieutenants of Aviation Section, Signal Reserve Corps, to duty as follows; R. B. McPherson to Berkeley, Cal. School of Military Aeronautics, University of California; F. O'D. Hunter and P. N. Hollowell to Foreign Detachment No. 3, Mineola, N. Y.; C. G. Spencer to Army Balloon School, Fort Omaha; H. H. Powell to Toronto, Canada, Detachment Aviation Section, Signal Corps; W. J. Jacobi will report to Chief Signal Officer of Army; J. P. Hermes to Champaign, Ill.; L. Gourlay to Signal Corps general supply depot, Mineola, L. I., N. Y.; H. A. Grant to Camp Kelly, South San Antonio, and to Dallas, Texas, not later than Nov. 1. (Sept. 22, War D.)

Officers of Aviation Section, S. O. R., to duty, Mineola, N. Y.: First Lieuts. J. C. Cone, P. N. Montague, J. Wentworth, W. H. Stovall. (Sept. 22, War D.)

Officers of Aviation Section, Signal Reserve Corps, to duty as follows: Capts. T. S. Baldwin to Akron, Ohio; H. S. Bacon to Washington, D. C.; First Lieuts. P. A. Beaton to Fort Omaha, Nebraska Balloon School; W. F. Kaynor to Columbus, Ohio, School of Military Aeronautics, Ohio State University; W. H. Warren to Washington, D. C.; T. F. Ward to Signal Corps Aviation School, San Diego, Cal.; F. Bahel to Middletown, Pa., 113th Aero Squadron. (Sept. 24, War D.)

Officers of Aviation Section, Signal Reserve Corps, to Fort Worth, Texas, for duty: First Lieut. L. B. Brady, Capt. W. Stokes, First Lieuts. R. W. Smith and C. C. Younggreen. (Sept. 24, War D.)

Aviation Officers

Officers of Aviation Section, Signal Reserve Corps, to duty as follows: Capt. T. Walkup to Memphis, Tenn., and telegraph Chief Signal Officer; First Lieut. G. S. Taylor to Hazlehurst Field, Mineola, N. Y.; First Lieut. H. B. Peter to Toronto, Province of Ontario, Canada, Aviation Section, Signal Corps.; First Lieut. G. Munn to New York, N. Y.; First Lieut. W. W. King to Wilbur Wright Field, Fairfield, Ohio. (Sept. 25, War D.)

Major H. B. Hersey, Aviation Section, Signal Reserve Crops, is rated as a junior military aviator. (Sept. 25, War D.)

Officers of Aviation Section, Signal Reserve Corps, to duty as follows: Major K. Banning to Chief Signal Officer; Capts. H. Mulliken to Washington; L. S. Scott to Mount Clemens, Mich., Selfridge Field; V. A. C. Henmon take station at Syracuse, N. Y.; W. Wadsworth as aeronautical officer, Eastern Dept., relieving Lieut. Colonel J. C. Gilmore, Jr., C. A. C., who will proceed to Fort Moultrie, S. C.; and assume command of the Coast Defenses of Charleston; P. D. Mills to Washington; J. A. Powell to Geneva, Ill.

First lieutenants of Aviation Section, Signal Reserve Corps, to duty as follows: D. Viele to Washington; O. B. Wyman to Signal Corps Aviation School, Camp Kelly, South San Antonio, Texas; H. W. White to Toronto, Canada, and Aviation Section, Signal Corps Detachment, relieving First Lieut. B. Goldblatt, Aviation Section, Signal Reserve Corps, who will proceed to San Antonio, Texas, Camp Kelly; H. C. Sigourney to Chief Signal Officer; L. F. Schultze to Hazelhurst Field, Mineola, N. Y.; C. F. McIntosh to Belleville, Ill.; J. E. Carter to Chief Signal Officer; R. S. Porter to South San Antonio, Texas, Camp Kelly. (Sept. 26, War D.)



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American aviators and those of the Allies fraternizing at the Y. M. C. A. "Eagle Hut" in London.

First lieutenants, Aviation Section, Signal Reserve Corps, to duty, Mineola, N. Y.: W. Winter and D. S. Seaton. (Sept. 26, War D.)

First lieutenants, Aviation Section, Signal Reserve Corps, to duty, Hazelhurst Field, Mineola, N. Y., for duty: D. Lyle, W. F. Goulding, M. E. Carter, Jr., M. C. Giesecke, G L. Erwin, Jr., W. M. Russell, R. E. Townes, H. Wilder, R. N. Wetherbee, H. C. Colburn, S. E. Elliott, H. H. George. (Sept 26, War D.)

First lieut. J. E. McKenna, Aviation Section, Signal Reserve Corps, to duty at War College Division, G. S., Washington. (Sept 26, War D.)

Second lieutenants of V. R. C. to duty at camps indicated: W. M. Henry Camp, Camp Logan, Texas; D. Lynch, Camp Custer, Mich. (Sept. 26, War D.)

Officers of Aviation Section, Signal Reserve Corps, to duty as follows: Capt. G. L. Jones to Seattle, Wash.; Capt. J. S. Reeves to Indianapolis, Ind.; Capt. R. Seiwe and First Lieutenant M. J. Czarniecki to Mount Clemens, Mich.; First Lieut. D. J. Payne to Hazlehurst Field, Mineola, Long Island, N. Y.; First Lieut. C. B. Ammon to Belleville, Ill., Scott Field; First Lieut. H. S. Robbins to Mount Clemens, Mich,; First Lieut. W. P. White to Mineola, N. Y.; First Lieut J. E. Enright to Belleville, Ill.; First Lieut. C. P. Eich to School of Military Aeronautics, Columbus, Ohio. (Sept. 27, War D.)

Officers of Aviation Section, Signal Reserve Corps, to duty as follows: Capt. F. L. Wells to Cambridge, Mass., Mass. Institute of Tech.; Capt. J. A. Buchanan to Camp Kelly, South San Antonio, Texas; Capt. D. Gray to Washington, D. C.; Capt. H. H. Hawkins to Atlanta, Ga., School of Military Aeronautics; First Lieut. W. A. Hoeveler, Jr., to Mineola, N. Y. (Sept. 28, War D.)

Aviation Section

Major R. P. Cousins, Jr. Military Aviator, Signal Corps, on being relieved at Austin, Texas, to proceed to Washington for duty. (Sept. 25, War D.)

Capt. R. S. Brown, Jr. Military Aviator, Signal Corps, to Langley Field, Hampton, for duty. (Sept 25, War D.)

Captains of Aviaition Section, Signal Corps, to Fort Sam Houston, Texas, for duty: C. A. Dunnigan, B. L. Meurhess, J. J. McQuillan, A. Bloom, C. H. Pelton, G. H. Taylor, G. A. Watson, W. E. Lansing and W. J. Petrick. (Sept. 25, War D.)

Capt. R. B. Barnitz, Aviation Section, Signal Corps, to San Antonio, Texas, Camp Kelly, for duty. (Sept. 25, War D.)

Officers of Aviation Section, Signal Corps, rated as junior military aeronauts, to date from July 24, 1917: Lieut. Col. C. de F. Chandler and Capt. J. Prentice. (Sept. 26, War D.)

Majors of Jr. Military Aviators, Signal Corps, to duty as follows: H. R. Harmon is designated as aeronautical officer of Southern Dept., vice Major P. L. Ferron, Signal Corps, relieved; Major Ferron will proceed to Washington, D. C.; T. H. Bane to Berkeley, Cal., for temporary duty, and upon completion thereof to Millington, Tenn., not later than Oct. 27, 1917, and assume command of Park Field, that place; J. C. McDonnell from duty at Rantoul, Ill., to Mount Clemens, Mich. (Sept. 26, War D.)

Lieut. Col. W. Mitchell, Aviation Section, Signal Corps, is rated as a junior military aviator from July 19, 1917. (Sept 28, War D.)

Trucks for Signal Corps for Aviation Work

Washington.—Motor trucks used by the signal corps for aviation work will be quite different from the standard army war trucks. There will be two sizes, the light truck specifications which were given in AERIAL AGE on Oct. 8. This truck will have a Continental C-2 engine, with a Monarch governor disk clutch, Brown-Lipe and G. M. C. selective gearset, worm drive, semi-elliptic springs, wood wheels shod with pneumatic tires 35 by 5 in front and 28 by 7 rear. The price of the chassis is to be $2,040.72.



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A group of American flying men outside the "Eagle Hut" in London, the social headquarters established by the Y. M. C. A. for our soldiers and sailors.

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THE BRITISH SOPWITH BIPLANES AND THE NEW TRIPLANE



THE Sopwith Aviation Co., Ltd., Canbury Park Road, Kingston-on-Thames, England, was established Autumn, 1911, by Mr. T. O. M. Sopwith, the well-known aviator, where, during 1912, a 70 H.P. tractor biplane and a 40 H.P. biplane were turned out.

The company is now a private limited company, and the officers are: Directors: T. O. M. Sopwith, M. G. Sopwith, R. O. Cary. General Manager, R. O. Cary. Secretary, H. P. Musgrove. Works Manager, F. Sigrist. The types of machines built in 1916 were: Scout Tractor, with an 80 H.P. Gnome; Military Tractor (2 seater), with 100 H.P. Gnome; School Seaplanes, with 100 H.P. Gnomes (originally built for the Greek Navy); Tractor Seaplanes, and the Sopwith "Bat Boat," with 90 H.P. Austro-Daimler motor and 200 H.P. Salmson motor, a type of flying boat.

At the present time the company is concentrating on a scout tractor, known as the "Pup," one of the fastest machines in the world, a military tractor (two-seater), which is known as the 1½ "strutter," a highly successful fighting machine, and a scout triplane, which is one of the fastest machines ever built. These machines have all been proven, and are in use by the British and foreign governments. Detailed measurements cannot, of course, be given. The motors in these machines are Clerget, Gnome, Le Rohne or Gnome-le-Rohne.

The Clerget 90 H.P. motor weighs 234 pounds, has seven cylinders with a bore of 120 mm. and a stroke of 160 mm. The 100 H.P. motor weighs 380 pounds, has nine cylinders with a bore of 120 mm. and a stroke of 160 mm.

The overhead inlet and exhaust valves are mechanically operated, driven independently by two eccentrics—a distinctive feature; one crank, single and dual ignition, aluminum alloy pistons. The crankshaft serves as an induction tube.

The Le Rhone motors are built in sizes delivering 60, 80, 110 and 150 H.P. at 1200 r p m. The 60 H.P. has seven cylinders, with a bore of 105 mm. and a stroke of 140 mm. It weighs 199 pounds. The other motors have nine cylinders. The 80 H.P. has a bore and stroke of 105x140 mm. and weighs 240 pounds; 110 H.P., bore and stroke 112x170, weighs 308 pounds; and the 150 H.P. bore and stroke 124x180, weighs 360 pounds.

The cylinders are turned from steel and fitted with cast iron liners. Cylinders screwed into steel crankcase. Two valves seating in cylinder head; induction via crankcase; shaft to crankcase and two valves seating in cylinder head; induction via crankshaft to crankcase and by external copper pipe to cylinder head. Forced lubrication. Consumes .72 pints of fuel and .1 pint oil per b.h.p.

The Gnome 100 H.P. has nine cylinders; bore 110 mm., stroke 150 mm. Weighs 280 pounds. Fuel consumption nine





Three views of the 1916 type Sopwith biplane called the "1½ Strutter." The fuselage is similar to that of the triplane, one of the fastest machines brought out by the present war.



Interior view of the Sopwith factory

gallons per hour. Made by Peter Hooker, Sta., Walthamstow.

At Monaco, one of the Sopwith scout seaplanes, won the Schneider Cup. It was equipped with a 100 H.P. Gnome. An official War Office test of a Sopwith scout land machine with an 80 H.P. Gnome, showed a speed variation of 40 to 95 miles an hour, fully loaded with pilot and 3½ hours' fuel. Performances far surpassing these were put up early in 1916, but details cannot be published.

A two-seater tractor of the 1915 type made a height record of 18,393 feet, but the Sopwith Pup on active service has passed the 25,000 feet level with a Naval pilot.

Weger to Build Motors

Cleveland.—The Weger Aeronautical Motor Co., has been incorporated here with a capital of $200,000. The company is allied with the Weger Motor Co., which owns patents on motors that can be used for aeronautical purposes. Arrangements have been made for royalty payments to the Weger Motor Co. A. L. Hammink is president of the aircraft company, C. B. Corlett is vice-president and S. G. Fleisher is secretary and treasurer. These with H. H. Brelsford and E. V. Raus comprise the directors.

Options Taken on Tract for Naval Aviators' School

Options on 20 acres of ground near Holdridge, Lake Minnetonka, for the establishment of a finishing school for naval aviators, who will receive preliminary instruction at Dunwoody institute, have been obtained by the Minneapolis Aero Club, it was announced by Sewell D. Andrews, director of the organization.

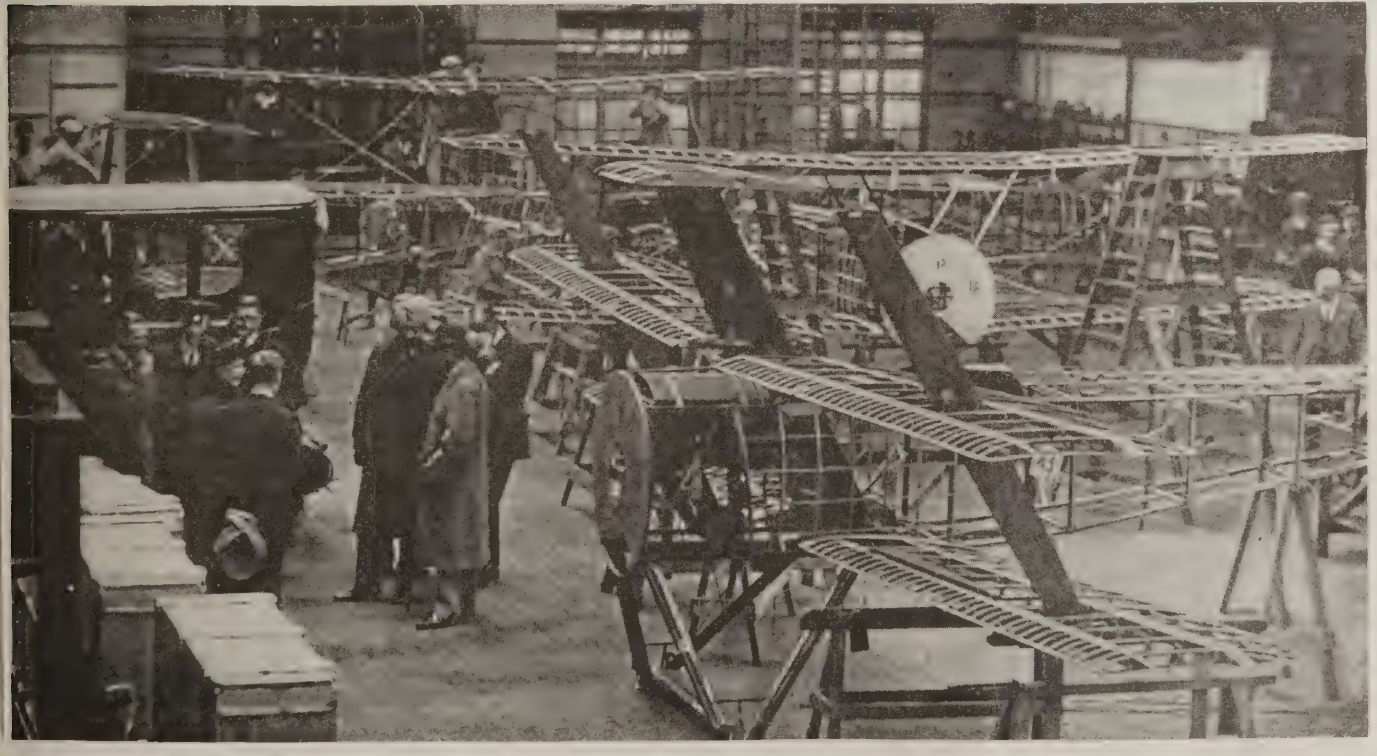
The club will construct hangars, machine shops and sleeping quarters on the site, which will be the only inland finishing school for navy aviators.



On the Belgian Front. A British pilot preparing for a flight in a Clerget-motored Sopwith triplane

Signal Corps Needs Stenographers

The Aviation Section of the Signal Corps needs 100 first-class stenographers and 100 clerks for immediate service abroad. Only men with excellent references will be considered for this special work. Applicants from 30 to 35 years of age are preferred. These men will be enlisted as first-class privates, but three-fourths of the number will be made non-commissioned officers. Applications may be filed at the office of the Military Training Camps Association, 19 West Forty-fourth Street, where an officer will conduct the personal examinations next week.



Interior of the Sopwith factory, during a visit by the King and Queen, showing one of the triplanes being assembled, and in the background the biplanes

IMPORTANT PROBLEMS DISCUSSED AT AIRCRAFT MEETING

AN important meeting of the Aviation Division of the S. A. E. Standards Committee was held in Washington on September 30 and October 1, and important conclusions were reached concerning standardization.

The meeting was called to order by General Manager Clarkson, who said that the object was so to take action on data which had been collected on several subjects. The different subjects would almost immediately be referred to sub-committees which already had been working on them. These sub-committees would go into session and would then report to the division.

Howard E. Coffin, chairman of the Aircraft Production Board, made a brief address. He said that all manufacturers of aircraft and of materials therefor were exceedingly busy, and it had therefore been very difficult to get action on many things which should have the attention of men in the industry.

At the conclusion of Mr. Coffin's address sub-committees went into session, and some of them continued their deliberations until late in the afternoon, except for an hour for lunch, which was taken at the Bureau of Standards. The subjects under consideration by the different subcommittees were as follows: Spark plug shell; dope; propeller shaft end and hub fittings; varnish; glue; pipe fittings (fuel, oil, air); radiator and jacket connection hose; engine weight specifications; pontoon fittings; safety belts; screws and bolts (eye bolts, fine threads, small and large diameter); tachometer connections; washers (plain, lock and bevel); wheels (hubs, spokes, rims and tires); tension wires, solid and stream line.

Magneto Dimensions

The first report to be made at Monday's session was that on magneto dimensions, by A. D. T. Libby. It was simply recommended that the depth of the dowel's pin hole be changed from ½ in. to ⅝ in. and that the width of the magneto space be increased from 5 in. to 6½ in. (165 mm.)

Varnish Specifications

"The material shall be the best long oil varnish, resistant to air, light and water. The manufacturer is given the greatest latitude in the selection of raw materials and process of manufacture in order to produce a product of the highest quality.

"The material shall comply with the following requirements: It shall be clear and transparent. Its color shall be no darker than a standard color solution made by dissolving 6 g. of pure powdered potassium bichromate in 100 cc. of pure concentrated sulphuric acid (specific gravity 1.84). Gentle heat may be used, if necessary, to secure a perfect solution of the bichromate. The color comparison will be made by placing the varnish and the standard color solution in clear, thin-walled glass tubes of the same diameter, 1.5 to 2 cm. (⅝ to ⅞ in.) to a depth of at least 2.5 cm. (1 in.) and comparing the colors by looking through the tubes across the column of the liquid by transmitted light. It shall not flash below 35 deg. C. (95 deg. F.) in an open tester.

"When flowed on a glass plate held in a vertical position and maintained at a temperature of 21 deg. to 32 deg. C. (70 deg. to 90 deg. F.) it shall set to touch at a point not less than 2.5 cm. (1 in.) from the side or top edges of the film, in not more than 5 hours; and shall dry hard in not more than 24 hours to a clear, hard, glossy and elastic film.

"A coat of varnish will be flowed onto either black iron or tinplate coated with a good quality of good baking japan, allowing to dry 48 hours in a vertical position and then immersing in boiling water for one hour. The water will be siphoned through a small glass tube directly from a container in which it is boiling, onto the surface of the panel, in such a manner that there will be no appreciable lowering of the temperature of the water before it touches the varnish film. The siphon delivery tube will be in a plane nearly parallel to the plane of the panel, so that the impact of the water will not tend to break the film. The varnish shall show no appreciable whitening and no more than a very slight dulling.

"The varnish shall be flowed on one side of a piece of terne plate 10 by 15 cm. (4 in. by 6 in.), which has been previously thoroughly cleaned with benzol. The coating must extend entirely across the width of the plate and for at least 14 cm. (5½ in.) of the length. The plate shall then be held in a vertical position for 6 hours at room temperature (21 deg. C. to 32 deg. C.) (70 deg. to 90 deg. F.). It shall then be placed in an oven at a temperature not less than 135 deg. C. (275 deg. F.) or more than 149 deg. C. (300 deg. F.) for 17 hours. It will then be removed from the oven, kept at a temperature between 21 deg. C. (70 deg. F.) and 32 deg. C. (90 deg. F.) for not less than 6 nor more than 24 hours. The panel with the varnished side on the outside will then be rapidly bent double over a rod 3 mm. (⅛ in.) in diameter at a point not less than 5 cm. (2 in.) or more than 7.5 cm. (3 in.) from the bottom of the plate. The varnish film shall show no cracking of flaking at the point of bending.

"The varnish will be applied in three coats to two unfilled panels of maple wood. Each coat will be allowed to dry indoors for 3 days and will then be lightly sandpapered before the application of the next coat. The final coat will not be sandpapered or rubbed, and the duplicate panels will be exposed outdoors, 45 deg. to the vertical, facing south, 3 days after the application of the finishing coat. The backs and edges of the panels will also be varnished with the same sample, but for these surfaces the details of the method of application as given need not be adhered to, and the effects of exposure on these surfaces will not be considered. On this test the varnish shall show satisfactory durability and weather resisting properties. In cases where the award of a contract cannot be delayed for the results of the exposure test, award may be made on the basis of the other requirements; but a varnish of any specific brand which does not show up satisfactorily on an exposure test may be omitted from consideration in future awards, and a preliminary submittal of samples for making exposure tests may be called for."

In the discussion it was brought out that this varnish is intended for application to both the spars and the wings, in the latter case as a protection for the dope. The above specifications are in the nature of recommendations only, but it is hoped to get action on them at the next meeting. Some discussion ensued as to the best place to make the tests—at the varnish factory or at the customer's plant. It was agreed that if the varnish could be shipped under seal it would be preferable to make the test at the varnish plant, especially if it should be found necessary to reject large quantities. Mr. Walker in this connection explained the Government's system for testing cement. It is tested at the factory and is kept in sealed bins, from which any department of the Government can withdraw cement. A representative of a large varnish firm said that varnish was usually made by them in quantities of 3,500 gal., and that to him the plan to take a sample of this lot for test, say under Government supervision, and ship the varnish in sealed containers seemed perfectly practical.

Mr. Payne, a representative of the British Government, said that experience had taught them that it was best to have a pigment varnish or color varnish on top of the spars, as light affects the cellulose acetate dope. The paint is really a protector for the dope. A suggestion was made that the recommendations of the committee should include a formula for solvents for removing the varnish. In regard to the durability test Mr. Manly pointed out that primary training machines have so many rough landings that it is advisable at the end of 60 days to tear off the fabric and examine the spars and wires beneath, so a much longer life is of no advantage.

Dopes Report

The report of the subcommittee on dopes was read by W. H. Smith of the Bureau of Standards. The committee recommended that two coats of acetate dope be substituted for spar varnish on training machines. The temperature of the doping rooms of aeroplane factories should be maintained at 70 deg. F. The aeroplane manufacturers should store the dope under a roof.

Dopes for aeroplane fabrics must consist of a clear, uniform mixture of ingredients and be capable of shrinking the fabric to the degree of tautness desired by the signal corps inspection. The residual film should give a smooth, homogeneous surface when applied in a horizontal position in an atmosphere not exceeding 65 deg. humidity and 75 deg. F. temperature, free from direct draft. Besides celluloid acetate there are nitrated dopes and the above requirements apply also to the latter.

The viscosity of the dope must permit of direct application without dilution at a temperature not lower than 60 deg. F. (Applies also to nitrate dopes.)

The dope, when dry, must adhere to the fabric with sufficient tenacity to prevent peeling off in sheets. Test strips should show lint attached to the side which has been in contact with the fabric. (This specification applies also to nitrate dopes.)

Four coats, or an equivalent of the dope, 48 hours after application, must increase the tensile strength of linen fabrics not less than 25 per cent of the original strength, and of cotton fabrics not less than 15 per cent. The increase in weight per square yard of doped fabric should not be less than 2 oz. nor greater than 3.5 oz. The test shall be made under standard conditions of humidity and temperature. (Applies also to nitrate dopes.)

No mineral acids may be present in the dope, and the amount of free organic acidity figured as acetic acid may not exceed 0.2 per cent. No compounds may be present which would be injurious to the fabric. (Also holds for nitrate dopes.)

Dopes which show the presence of free sulphuric acid or sulphates by the test given below are not acceptable. (Omitted in specification for nitrate dopes.)

Dopes containing tetrachlorethane are not acceptable. (Omitted for nitrate dopes.)

The cellulose acetate used should be neutral and stable and completely soluble in acetone. The amount of cellulose acetate should be not less than 60 grams per liter.

Exposure Test

The volatile solvents employed should present no danger to the workmen applying them. (Applies also to nitrate dopes.)

Five drops of gasoline dropped on the film which has been dried for 48 hours and immediately ignited should have no more serious effect than to char the fabric under the moistened section of the film. (Omitted from specification for nitrate dopes.)

Dopes must comply with the following test: A square frame, 12 in. by 12 in., inside measurement, is covered on both sides with fabric, the fabric being tacked to the outer side of the frame. The fabric is to be tacked under uniform tension, simulating that employed in aeroplane manufacture. Four coats or an equivalent of dope are to be applied to each side of the frame, each coat being allowed thoroughly to dry before the succeeding coat is applied. The frames are to be exposed on a roof in an unshaded horizontal position. After 60 days of constant exposure no spontaneous cracking of the doped surface should be apparent, and after one hour at a temperature of 70 deg. to 80 deg. F., the film shall not crack and shall have a decided ring. This test shall be made comparatively with a dope that has previously passed the test. (Applies also to nitrate dopes.)

Dope shall be shipped in metal cans, metal or wooden barrels or earthenware containers. Inspection of the containers shall be permitted to insure against the introduction of foreign material. The container shall be marked with the date of manufacture, serial number, gross, tare and net weight. (Applies also to nitrate dopes.)

Filtration Test

A 500-cc. beaker, containing about 200 cc. of water, is counterbalanced on a large balance. The balance is adjusted to one-hundredth gram by adding or removing water. About 10 grams of dope are poured into the water and the increase in weight noted. This is rapidly done to 0.01 gram to diminish solvent loss. The dope is stirred up and allowed to stand 10 to 15 minutes with occasional stirring. The liquid is decanted through a rather porous filter into an 800-cc. beaker and 150 cc. of warm water added to the residue. It is allowed to stand 10 to 15 minutes with frequent stirring and poured through the filter into the 800-cc. beaker. The residue is washed with 150 cc. of warm water as before. A few drops of phenolphthalein are added and the solution titrated with tenth-normal caustic soda to a color that persists for one-half minute.

Some dopes, notably those containing much acetone, when poured into water precipitate as a milky solution containing shreds of the acetate. The resulting liquor filters slowly and passes through the filter paper in a cloudy conditon. Since the acetate is finely divided, it is practically free from acetic acid and additional washing is unnecessary. The end-point is not quite as sharp as when all the acetate has been removed, owing to hydrolysis of the suspended material, but is sufficiently accurate for all practical purposes. Absence of mineral acids must be proved by qualitative tests.

Sulphate Test

Twenty grams of cellulose acetate are allowed to remain at the temperature of the steam bath for 24 hours. The resulting liquor is filtered and tested for sulphates. (Omitted from specification for nitrate dopes.)

Pour 100 grams of the dope into 300 grams of 95 per cent alcohol, stirring constantly. Filter the precipitate on a Buchner funnel and dry at room temperature. Extract in a soxhlet with ether until all extractive material has been removed and dry at 60 deg. C. to constant weight.

Pour some of the dope on a glass plate and allow to dry spontaneously. The film may be examined for the general characteristics of

transparency, coherence, strength and flexibility.

Mr. Manly said he appreciated the warning contained in the specifications that dope must be kept under roof, for at his plant they had allowed twenty-five barrels of the material to remain outside. The point was brought out that the navy puts color varnish over the dope to prevent the effect of sun rays. All dopes seem to stand up well when left in the dark Some difficulty was hinted at as unavoidable when trying to put a coat of color varnish over dope is it will become streaky. Constructive criticism on this report is asked for and action is expected on it at the next meeting.

Pontoon Fittings

The sub-committee on pontoon fittings, after reconsidering its two previous reports, voted that these details were not in form for standardization at the present time and that it was the sense of the meeting that every effort of those present should be made toward trying out different kinds of handholes, etc., with a view at the earliest possible future date to again consider what would be the best practice for standardization.

Engine Weight Specifications

John R. Cautley read the report of the engine weight specifications sub-committee. Although not acted on at this meeting it was quite likely that the report will be accepted as read.

This report also includes blanks for filling in the weights of all engine accessories, make of same and whether this weight is included in the engine weight or not.

Spark Plug Shell Report

O. C. Rohde made the report for the spark plug shell sub-committee. Investigation seems to show that a 1-in. hex is nearest to foreign standard. Further information is being sought on the Italian standard. If a 1-in. hex proves to be approximately the foreign standard, it will be recommended for aeroplane plugs. If the 1-in. hex is not found to agree with the foreign standards, some size now in use, preferably 15/16 in., will be recommended for adoption. In case a 1-in. hex is adopted and 1.025 in. is found to represent foreign practice, a spark plug wrench with a minimum dimension of 1 1/32 in. is recommended.

Where threads are chased, a flange 3/64 in. thick and .003 in. larger in diameter than the outside thread diameter is recommended, the neck to be .625 in. diameter by 5/64 in. thick. Where threads are rolled they may run to the shoulder.

It is recommended that 3/32 in. be the minimum dimension from the bottom of the thread chamfer to the bottom of the shell.

Safety Belts

No definite recommendations were made by the sub-committee on safety belts, but M. Hunsaker had procured a sample of English manufacture which was exhibited at the meeting. This consists of two pieces of elastic webbing about 7 inches wide laced at the back with cotton and secured together in front by a buckle clasp. This was said to be satisfactory to the army. The navy was said to be using a somewhat different design. Captain Chauvalon thought that the lacing might better be of rawhide and that he would prefer elastic webbing in the fastening straps. Mr. Riddell submitted a belt and safety catch as used by the Canadian air forces. It was suggested to submit Mr. Hunsaker's sample to the navy and ask them whether it would not meet their requirements.

Wheel Rims

J. E. Hale presented a progress report for the sub-committee on rims and wheels. It has been decided to make the rims of .093 stock containing .010 to .020 per cent carbon. Mr. Manly thought this was of insufficient strength. His own experience has shown that the weakest point of the wheel was in the rim, owing to the nipple holes in the rim. His firm had recently declined a shipment of rims made of steel containing about 18 points carbon. In a certain compression test a rim made of 26-point carbon steel withstood a pressure of 15,000 pounds, while rims made of the lower carbon steel gave way at 10,000 pounds. In reply Mr. Hale said that the 10-20-point carbon steel had been recommended because the rim makers considered it a safe and sane material. With higher carbon there were many failures, especially in cupping for the spoke heads. He asked Mr. Manly whether he had ever experienced a failure of a wheel due to a weak rim. To this Mr. Manly replied he had seen failures of wheels occur while the airplane was running over rough ground. First some spokes would losen and then the load would be unevenly distributed and the wheel would fail. Mr. Manly also told of a case where one concern rolled the rims of medium carbon stock and another punched the nipple depressions. A great many rims were lost due to splitting of the material at the nipple holes. This trouble was eliminated by bestowing more care on the punching operation, working more slowly.

Screw and Nut Committee

E. H. Ehrman presented the report for the screw and nut sub-committee. This report covered aeroplane bolt threads, fine threads, spring washers, plain washers, bevel washers and eye bolts.

Glue for Propellers

A sub-committee on glues made a report containing specifications for all glue used for propeller construction and for splices of important structural members such as longerons and beams.

The glue must be a high-grade hide glue, sweet and free from any deleterious substances. The glue shall be compared to a standard sample for adhesiveness, jelly strength, viscosity, grease and foam. The standard sample may be obtained from the director of the Forest Products Laboratory, Madison, Wis., or may be a sample of a glue which has been satisfactorily used in propeller construction and certified to by the authorized glue expert of the purchaser.

Tests on glue shall include tests made at the glue factory and tests made at the aeroplane factory. Tests at the glue factory are to insure a proper quality and certification of this quality. These tests shall be made by comparing the run of glue with the standard sample.

The bidder may compare his glue with the standard sample by any method he desires. The tests by the purchaser, however, will be made as follows:

The strength test will be made by gluing together two pieces of yellow birch 1 inch thick, having a shearing strength of at least 2,200 pounds per square inch. This will require birch having an air-dry weight of about 50 pounds or more per cubic foot, and a moisture content of from 8 to 12 per cent. These should be tested by shearing them in a testing machine. The glue will be mixed in proportion recommended by the glue manufacturer. It will then be melted in a water bath and applied to the wood at a temperature of about 60 deg. C. (140 deg. F.). After gluing the test blocks will be held in clamps for 24 hours, then removed from the clamps and allowed to stand for six additional days. They will then be finished so that the blocks when ready to test will have a glued joint 2 inches square and will be of the shape shown in the sketch. When tested in this way no test block shall fail under a load of less than 2,200 pounds per square inch.

The jelly strength will be determined upon a mixture containing 12 parts of water to 1 part of glue. The glue will be soaked and melted as described under "Adhesiveness," then allowed to stand over night in a refrigerator at a temperature of 5 to 10 deg. C. (40 to 50 deg. F.). The relative strength of the standard sample and the bidder's sample will then be determined by pressure with the fingers immediately after the samples are removed from the refrigerator.

The viscosity will be determined in an Engler viscosimeter upon a sample containing 1 part of glue to 5 parts of water, soaked and melted as described under "Adhesiveness." Two hundred cubic centimeters of the glue mixture will be run through the viscosimeter at a temperature of 60 deg. C. (140 deg F.).

The relative amount of grease present will be determined by mixing dye with some of the sample remaining from the viscosity test, painting it on unsized white paper and observing the grease spots.

The foam will be tested on the sample used for viscosity. The sample heated to 60 deg. C. will be beaten for one minute with a power egg beater or similar instrument, and allowed to stand one minute, or until the height of foam can be measured.

The odor of the glue when in the hot solution must be sweet and must remain sweet for 48 hours; that is, free from any suggestion of deteriorating animal matter.

Glue

The glue which has been tested at the glue factory shall be barreled in the presence of the purchaser's representative and marked with the run number, rate of run and inspector's stamp. The glue which is marked in this manner may be sold as certified glue for airplane construction.

Mr. Riddell, of Canadian Aeroplanes, Ltd., said that in testing glue he had used a test specimen like the second shown in the committee report and found that many specimens did not fail in shear but split apart. He therefore adopted a shear test specimen as shown herewith, which is glued up of three pieces and then has a slot cut through it at the center. The specimen should preferably be placed on a block of soft wood when subjected to the shearing pressure.

A tension test is also being considered by the committee, in addition to the shear test, as it is plain that in a propeller, for instance, the strain on the glued joints is not pure shear strain. In this connection a sketch was shown of the British tension test specimen for glue and is reproduced herewith. It consists of two wood blocks beveled at the edges of the surfaces on which they are glued together. Mr. Riddell stated that the British test for glue for ply wood called for soaking the wood for three hours in water at from 100 to 110 deg. F., and that it had been found very difficult to meet this test.

Another subject down on the program was that of wing attachments, but from a report to Mr. Hanks by G. C. Loening, under date of September 7, it appeared that nothing could be done in this matter at the present time.

John B. Tuttle, associate chemist of the Bureau of Standards, presented a brief report on rubber hose for gasoline connections. Mr. Manly said that neither the British nor the French aerial forces at the present time had an entirely satisfactory type of gasoline tube. Mr. Riddell, of Canadian Aeroplanes, Ltd., said that flexible meal tubing was not satisfactory because it developed leaks, and copper tubing often failed in service owing to excessive vibration, so that the Royal Flying Corps now insisted on rubber tubing for gasoline. Metal tubing is, however, still being used for oil and air lines. The discussion brought out that when rubber is used for carrying gasoline it swells and the effective inside diameter is very much decreased. Mr. Tuttle stated that a tube had been developed recently by one of the large rubber companies which seemed to meet all requirements satisfactorily.

List of Those Present

Frederick A. Aspinwall, Signal Corps.
A. K. Atkins, Lt.-Comm. U.S.N.
Lewis H. Austin, Perry-Austin Mfg. Co.
Lieut. Blood.
F. W. Caldwell, Signal Corps.
Capt. Carlo Tappi, Italian Av. Corps.
John R. Cautley, Wright-Martin Airplane Corp.
Lt. Felice Testoni, Italian Av. Corps.
Capt. E. C. Thibault de Chauvalon, French Aviation Comm.
C. F. Clarkson, S. A. E.
Hubert Chase, S. A. E.
Roger Chauveaux, Signal Corps.
Jasper E. Crane, Chem. Dept., Du Pont de Nemours & Co.
H. E. Coffin, Chairman, Aircraft Prod. Board.
James W. Davis, The Burgess Co., Marblehead, Mass.
Dr. H. C. Dickinson, Bureau of Standards.
Wm. F. Doerflinger, Perry-Austin Mfg. Co., New York.
F. S. Duesenberg, Duesenberg Motors Corp.
F. J. Diffin, Washington, D. C.
E. H. Ehrman, Chicago.
Edwin L. Georger, Pratt & Lambert, Buffalo, N. Y.
A. R. Gormully, Fiat.
B. D. Gray, Signal Corps.
Ely Griswold, Griswold Mfg. Co., Erie, Penna.
J. E. Hale, Goodyear Tire & Rubber Co., Akron, Ohio.
M. W. Hanks, S. A. E.
Daniel F. Harriman, Wright-Martin Aircraft Corp.
Louis P. Hammett.
Spencer Heath, Baltimore.
P. M. Heldt, Class Journal Co., New York.
F. W. Herz, National Varnish Co.
W. H. Hill, Signal Corps.
Thomas H. Huff, Standard Aircraft Corp.
Naval Constructor Hunsaker, U.S.N.
Howard Huntington, Huntington Aircraft Co., Princeton, N. J.
J. B. Johnson, Signal Corps.
Charles B. King, Signal Corps.
Fred H. Lane, Chief Chemist, Emil Calman & Co., New York.
A. D. T. Libby, Splitdorf Electrical Co., Newark, N. J.
G. C. Loening, Consulting Engineer, Long Island City, N. Y.
C. W. McLaughlin, Signal Corps.
James D. Macgregor, Signal Corps.
Hugh McIsaac, W. S. Aero Corp. of Cal.
C. M. Manly, Curtiss Aeroplane Corp.
Captain Howard Marmon.
Carl T. Mason, Splitdorf Electrical Company.
Paul D. Merrick, Bureau of Standards.
Lieut. A. Mignot.
J. J. Moosman, E. I. Du Pont de Nemours & Co.
Capt. Stafford Montgomery.
F. L. Morse, Ithaca, N. Y.
H. E. Morton, B. F. Sturtevant Co., Boston, Mass.
G. L. Morris.
Howard B. Oakleaf, Signal Corps.
S. H. Page, Union Gas Engine Co., San Francisco.
E. E. Pennewill, Standard Aero Corp., New York.
John A. Pierson, Wright-Martin Aircraft Corp.
R. E. Plympton, S. A. E.
Lieut. W. F. Prentice, Br. Aero Supply Dep.
Lawson Valentine Pulsifer, Valentine & Co., New York.
M. R. Riddell, Canadian Aeroplanes, Ltd., Toronto.
O. C. Rohde, Champion Spark Plug Co., Toledo, O.
John E. Sloan, Signal Corps.
W. H. Smith, Bureau of Standards.
G. B. Spear, Signal Corps.
Lieut. D'Amico, Stefano Italian Av. Corps.
Carl E. Sullivan, Signal Corps.
Rolf Thelen, U. S. Forest Service.
John B. Tuttle, Bureau of Standards.

FOR THE MEN WHO ARE TO GO OVERSEAS

HAVING received a number of requests from aviation instructors and students for French aeronautic literature and realizing that the students who will soon go to France should be familiar with the French aeronautic terms as popularly employed in descriptive literature—instead of merely giving a dictionary of terms; and realizing also the necessity of familiarizing them with the general features of the German machines which they will have to fight, AERIAL AGE sent to France for the very latest technical aeronautic literature and description of German machines.

The first instalment, given herewith, is part of a chapter of the work "L'Aviation Et La Guerre," edited for the Aero Club of France by Jean Lagorgette, the noted French aeronautic engineer.

Officer instructors have suggested that the best plan would be to print the French text without attempting to give the English translation of every word, as the first need is to supply the instructors with the necessary material, to enable them to read from the French and explain to the students while they take notes, which is the present practice in teaching all the other subjects.

In following this advice we are adding the translation of the most common terms and metric table to enable the instructors and students alike to quickly convert metric measurements into the English measurements and vice versa, which will be published in the next number of AERIAL AGE.

Abaft	Arrière
Accessories	Accessoires
Accumulator	Accumulateur
Aeroplane	Aéroplane
Aeronaut	Aéronaute: Aviateur
Aerostat	Aérostat
Aft	Arrière
After (rear)	Arrière
Air-cooled	Refroidit par l'air
Angleiron	Cornière
Anti-friction metal	Métal anti friction ou régule
Aviation	Aviation
Aviator	Aviateur
Babbit Metal	Métal Babbitt ou régule
Balance	Equilibre
Ball bearings	Coussinets à billes
Ballonet	Ballonet
Battery	Batterie
Bearing metal	Métal pour less coussinets ou régule
Behind	Derrière
Bevel geared	Engrenage Conique
Biplane	Biplan
Blades (of propeller)	Pales
Body	Fuselage ou Nacelle
Bolt	Boulon
Box-kite	Cerf-volant
Bracket	Tasseau
Brake	Frein
Breadth	Largeur
Canvas	Toile
Car	Nacelle
Carburetter	Carburateur
Casting	Moulage
Centre of Gravity	Centre de Gravité
Chain driven	Tranmission par chaîne
Chassis	Chassis
Circumference	Circonférance
Clutch	Embrayage
Connection	Couplage
Control	Direction
Coupled	Jumelé
Crank shaft	Arbre à manivelle
Cylinder	Cylindre
Die cast Bearings	Doussinets montés en coquilles
Dirigible	Dirigeable
Diameter	Diamètre
Direct driven	Prise directe
Electric welding	Sondure électrique
Elevator (horizontal rudder)	Gouvernail de profondeur
Engine	Moteur
Fan	Ventilateur
Fittings	Garniture
Flight	Vol
Flown	Volé
Fore	Avant
Forward (in front)	En avant
Frame / Framework	Fuselage or Cadre or Poutre

Caractères généraux

Loin d'avoir persisté dans l'homogénéité presque absolue de leurs types d'avions, qui s'était accrue au cours de l'année 1915, les Allemands en ont, en 1916, dessiné et essayé de nouvelles séries, si bien qu'ils disposent actuellement de plusieurs sortes de types d'aéroplanes. Des marques secondaires ont pris de l'importance. D'autres ont créé des filiales. De nouvelles ont été fondées. Les différences sont nombreuses, mais minimes.

Nous avons retracé les programmes de l'aviation allemande depuis le début des hostilités (**Aérophile**, fév. 1917, p. 55 et suiv.), et il n'y a à y ajouter que les types D. II et C. V., étudiés ci-après :

Nous ne reviendrons pas sur les modèles 1915-1916, que les Allemands laissent encore en vedette sur les fronts orientaux, et dont quelques-uns — Rumpler, L. V. G., Albatros C. III — sont encore en usage sur le front occidental. Nous nous sommes efforcé de faire connaître ces avions par nos albums de silhouettes de 1916 et de 1917, par nos tableaux synoptiques édités par l'Aéro-Club, par des notices dans l'**Aérophile** (fév. 1916 à fév. 1917) et dans la 1re série de notre livre « Les Aéroplanes allemands ».

Nous avons décrit les moteurs Mercédès, Benz et Argus, dans l'**Aérophile** (1916, mai, p. 129 à 140); nov., p. 335-337, et déc., p. 379-381).

Tous les avions allemands actuels sont des **biplans à fuselage et à hélice tractive.** Les monoplans Fokker sont relégués sur les front orientaux. Un seul avion, le bi-moteur Gotha possède des hélices à l'arrière. Notons du reste que dans les publications germaniques récentes, le dogme, jusqu'ici intangible en Allemagne, de la supériorité des hélices tractives ne paraît plus aussi absolu.

La plupart, d'ailleurs, des caractères nouveaux sur les avions allemands sont empruntés aux avions alliés, ou inspirés d'eux ou en ont subi l'influence.

Sur aucun l'envergure des ailes inférieures n'est beaucoup plus courte que celle des ailes supérieures. Elle lui est généralement presque égale, et exceptionnellement égale (Halberstadt et Fokker de chasse Albatros B. F. W. et Roland biplaces).

Leur tendance est générale à abandonner le V ou la flèche, ou tous deux à la fois, surtout sur les avions de chasse; et, sans aller jusqu à supprimer le relèvement progressif des ailes vers l'extrémité (gauchissement permanent), ils en simplifient toutefois les réglages d'incidence, qui comportent maintenant seulement 4 ou 6 cotes, après en avoir comporté, comme sur l'Albatros C. III, autant que de nervures, soit 50. Il y a tendance à adjoindre des parties compensatrices aux ailerons.

Les plans fixes stabilisateurs sont moins énormes, moins allongés vers l'avant qu'aux types 1915-16, et ils ont une incidence souvent moindre (parfois réglable en trois positions) ou nulle.

La plupart des gouvernails sont compensés, et cela par une sorte de bec (1 au sommet du gouvernail de direction, 2 aux extrémités du gouvernail de profondeur). Leurs contours sont arrondis ou au moins courbes; l'ensemble formé par le gouvernail de profondeur et le stabilisateur fixe tend à abandonner la forme triangulaire échancrée pour prendre un aspect demi-hexagonal, ou presque circulaire, souvent non échancré.

Le gouvernail de profondeur est en effet d'un seul tenant, sur plusieurs types d'appareils; mais, sur d'autres, il reste composé de deux volets.

Le gouvernail de direction est, souvent, situé au-dessus du niveau des gouvernes de profondeur, tantôt en avant, tantôt en arrière, plutôt qu'au même aplomb.

Contrairement à la tendance générale en Angleterre, où de nombreux appareils ont des ailerons aux ailes inférieures comme aux ailes supérieures, et suivant la tendance générale en France, les biplans allemands, qui ont tous des ailerons (sauf peut-être encore un Fokker), n'en ont qu'aux ailes supérieures. Il y a tendance à rendre leur commande plus complètement intérieure aux ailes, et même à adopter le système des Nieuport, Spad, etc.

Au « tréteau » s'est substituée une cabane à six mâts, parfois solidaires par deux ou trois, plus ou moins divergents, et, surtout sur les avions de chasse, très peu élevés. C'est dire que les ailes supérieures ont été abaissées, rapprochées du fuselage (au point d'être

montées parfois sur sa crête) et des ailes inférieures; et souvent les ailes supérieures comportent une section fixe dans laquelle s'encastrent plus ou moins complètement la nourrice et le radiateur, au lieu de causer une résistance supplémentaire et une gêne à la vue. Les nouveaux radiateurs consistent en tubes horizontaux, dont l'ensemble épouse la forme des ailes; l'air pénètre par dessous, et sort au-dessus.

Les ailes inférieures sont fixées souvent sur un méplat du fuselage ou sur une amorce d'ailes, et par de simples clavettes, substituées aux anciennes attaches de formes très particulières et très variées

Le fuselage est gros, parfois énorme, de section plus ou moins arrondie et souvent véritablement monocoque (sur tous les avions de chasse), ou au moins recouvert de contreplaqué.

Des avions de chasse, le cône de pénétration (calotte) s'est étendu même aux grands avions.

Au point de vue de l'aspect extérieur, les toiles blanches ou écrues ont fait place sur presque tous les avions allemands à un camouflage tout à fait semblable à certains Nieuports : bleu très clair ou jaune pâle sous les ailes, et bariolage vert et brun ou brun-rougeâtre assez foncés au-dessus des ailes et sur toute la queue et tout le fuselage. Il ne faut d'ailleurs pas chercher en cette particularité un signe distinctif bien sûr.

Les avions allemands peuvent être divisés en trois grandes catégories :

1° Mono-moteurs monoplaces de chasse (et accessoirement de reconnaissance);

2° Mono-moteurs biplaces à tous usages

3° Bi-moteurs triplaces.

Au point de vue des moteurs, la règle pour les nouveaux types consiste dans le moteur fixe à cylindres verticaux séparés (généralement 6 cyl.; un type à 8 cyl.), à refroidissement à eau, et, **au point de vue de leur puissance, cette règle impose :**

POUR LA CHASSE, 1 MOTEUR 175-180 HP (et non comme on se plaît à le répéter par exagération, un 220 HP, dont ces avions de 24 à 25 mq. pourraient à peine soulever les 500 kilos, y compris les accessoires, l'eau, etc.);

POUR LES AVIONS COURANTS, 1 MOTEUR DE 225-240 HP (à 6 ou 8 cyl. verticaux) **OU DE 260 HP** (6 cyl.). Le 260 HP étant à peine plus lourd que le 235 HP et ayant un meilleur fonctionnement, il est à prévoir qu'il se substituera au 235 HP;

POUR LES GRANDS AVIONS, 450 OU 520 HP EN DEUX MOTEURS.

I. — MONOPLACES DE CHASSE

Ces monoplaces sont dérivés de l'Albatros de chasse mis en service au commencement de 1916 pour la bataille de Verdun et qui a été légèrement modifié depuis lors. Ils se ramènent pour chacune des marques à 2 grandes catégories : D. I et D. II, — ces derniers un peu plus petits et surtout moins hauts, car leurs ailes supérieures ont été abaissées sur une cabane à mâts divergents (et non plus en tréteau) au point d'affleurer, ou presque, le fuselage, monocoque, qui est très gros.

D'une manière générale, ils restent plus grands et surtout plus massifs que les Nieuport ou les Spad.

Leur envergure varie de 8 m. 45 à 9 m. 50.

Leurs ailes n'ont, sur plusieurs, ni V ni flèche.

Plusieurs ont les ailes décalées, et deux d'entre eux, l'Albatros D. III et le Rex ont les ailes inférieures moins profondes, plus minces et les mâts en V.

Les uns ont une seule paire de mâts par demi-cellule; d'autres en ont deux.

Leurs gouvernails sont compensés, et ceux de profondeur ont souvent un contour de pelle.

Le moteur est généralement un fixe Mercédès 175 HP (ancien 150 HP à rendement amélioré), parfois Argus 120 HP, et exceptionnellement un rotatif Oberursel. (Gnôme).

L'armement normal consiste en deux mitrailleuses fixes, généralement de Spandau, parallèles, une de chaque côté du moteur fixe et tirant en avant à travers l'hélice. Avec les rotatifs, une seule mitrailleuse, fixe, un peu à droite. Toutes fonctionnent par le système Fokker, tel que nous l'avons décrit (**Aérophile**, 1916, juin, p. 157 à 160; et 1917, janv., p. 23, et févr., p. 54).

1° Albatros D. I et D. II

Nous ne reviendrons pas longuement sur cet avion, précédemment étudié en détail (**Aérophile**, fév. 1917, p. 49 à 54). Il en existe trois variantes : types D. I, D. II et D. III (ce dernier étudié à part). Ils sont construits par l'Albatros-Werke G. et ses filiales et par la B. F. W. (Bayerische Flugzeugwerke G., de Munich.)

Un soi-disant Albatros Bü n'était autre qu'un D. I. — Bü, K, etc., peints sur le fuselage sont des initiales de noms d'hommes et non des types d'avions.

Un D II (n° 210, construit par l'Ostdeutsche Albatros-Werke G.) était monté par le prince Frédéric-Charles. C'est principalement d'après cet avion qu'est rédigée la description suivante.

On y reconnaît l'influence des alliés par l'abandon de plusieurs caractéristiques des anciens avions allemands et par l'adoption de plusieurs dispositions empruntées aux appareils français ou anglais

Longueur : 7 m. 30. Hauteur : 2 m. 65 (2 m. 90 au D. I) sans l'hélice.

L'envergure des AILES supérieures a été réduite de 8 m. 60 sur le D. I à 8 m. 45 sur le D. II. Celle des ailes inférieures (8 m. 05 à 8 m.), lui est presque égale. Profondeur : 1 m. 60. La surface est de 24 m² 50.

Les supérieures sont décalées en avant d'une manière fixe et non plus réglable. Elles sont largement échancrées à l'arrière, à mi-envergure, au-dessus de l'habitacle du pilote.

Une seule paire de mâts (en tube profilé) par demi-cellule. Ils sont réduits à une hauteur de 1 m. 25, soit un abaissement de 0 m. 25 des ailes supérieures par rapport au type D. I; et, corrélativement, une cabane évasée et basse, composée de chaque côté de 3 mâts en N, solidaires et inclinés vers l'extérieur, a été substituée à la haute cabane à forme de tréteau

Les ailes présentent un gauchissement permanent. Leur incidence a été réduite; elle est de :

5°6', à la 2e nerv. de l'aile inf. gauche 5° à droite
5°18', à la 7e nerv. de l'aile inf. gauche 5°24' —
4°12', à la 10e (dernière avant le bord) 4°42' —

Cette dernière nervure échappe d'ailleurs à l'action directe des haubans.

Les ailerons, très allongés, sont montés sur un 3e petit longeron.

Le plan supérieur est d'un seul tenant

Les longerons sont très rapprochés du bord antérieur et entre eux et laissent en arrière une grande partie d'aile. Comme au Roland, ils sont en sapin évidé, marouflés à plat, et très gros : 60 mm. de largeur, sur 70 mm. en moyenne d'épaisseur, avec des méplats en sapin collé à l'emplacement des colliers situés au-dessous et au-dessus des mâts. Ils sont entretoisés par 10 tubes de 20 mm. dans les ailes supérieures, et par

6 tubes dans les inférieures, avec croisillons en corde à piano de 2 mm. 5.

Le 3e longeron, en sapin, est en I de 18×45 jusqu'à la naissance des ailerons ; et, au delà, en U de 16×32, avec vide sur le côté intérieur.

Nervures : âme de 4 mm. en peuplier, d'une seule pièce entre longerons, avec chapeau en frêne mesurant 11 mm. 5×3 mm ; taquets, en contre-plaqué. La nervure contiguë à l'aileron est semblable, mais avec chapeaux de 30 mm. rejetés d'un seul côté, et donnant une coupe en U couché.

Entre 2 nervures voisines : 1 fausse nervure, consistant en un chapeau supérieur en frêne.

Le bord d'attaque est en sapin, entoilé, sauf dans son évidement ; le bord extrême, de coupe presque elliptique de 30×12, est en frêne.

Le dépouillement, l'amincissement des longerons et des ailes à leur extrémité est prélevé entièrement sur la face supérieure, d'une manière très brusque (à partir de la dernière nervure, soit sur une envergure de 0 m. 40)

Les **GOUVERNES** de profondeur forment un ensemble arrondi à contour de pelle : 1° très vaste plan fixe (1 m² 40) en deux parties épaisses, en bois et contre-plaqué sans arc-boutant (d'où trépidations) et montées sur 3 tubes de 845×30 (l'antérieur : 10), qui traversent le fuselage ; et 2° volet mobile de 1 m² 10, d'un seul tenant avec pointes compensatrices en forme de bec, en avant du pivot.

Les plans de dérive, en bois et contre-plaqués, sont fixés à demeure au-dessus du fuselage (0 m² 55) et en dessous entre les montures de la béquille (0 m² 25), dont la verticale, située très en avant de la pointe du fuselage, à un endroit où ce fuselage offre encore de l'épaisseur, donne appui au gouvernail de direction (0 m² 55), qui est tout entier en retrait par rapport au G. Pr., au-dessus du fuselage et également compensé.

Les volets mobiles sont construits en tubes et entoilés.

FUSELAGE : longueur 6 m. 50, hauteur et largeur maximum 1 m. 25×0 m. 93. Monocoque à flancs un peu aplatis, et s'amincissant à l'arrière horizontalement, mais avec une sorte de quille-dérive. A sa base, épaulement auquel s'adaptent les ailes inférieures. Il est bâti sur 6 longerons (comme tous les Albatros), avec legers cadres transversaux à équerres, le tout revêtu de contre-plaqué et sans un centimètre de câble ni de corde à piano.

Une cloison évidée de 25 mm. en 16 épaisseurs de placages constitue la ferme qui supporte la béquille et le gouvernail.

T. A. ordinaire : 2 V en tube, assez hauts, et 2 roues. Pneus Continental ou Harburg-Wien de 810×125.

BEQUILLE en frêne, sous monture mince (et non pyramidale) formant dérive.

MOTEUR Mercédès à 6 cylindres verticaux, séparés, en ligne (170 HP à 1.450 tours au Mercédès 27.911 sur le D. I/391 ; 176 HP à 1.450 tours sur le n° 30.652 du D. II/910).

Il est placé à l'avant.

Immédiatement derrière lui, se trouve le réservoir d'essence (marque Seeger), en forme de disque vertical de 21 cm. d'épaisseur, un peu allongé et épousant la forme du monocoque. Il est séparé par une cloison horizontale en 2 parties : l'inférieure forme un réservoir de 90 litres (avec « montre à benzine » pour 85 l.) et la supérieure, formant nourrice, contient 25 à 29 l.

A droite, au-dessus de l'assise du moteur, réservoir en forme de cylindre terminé par 2 demi-sphères, contenant 9 l. d'huile.

Hélice Garuda, avec calotte.

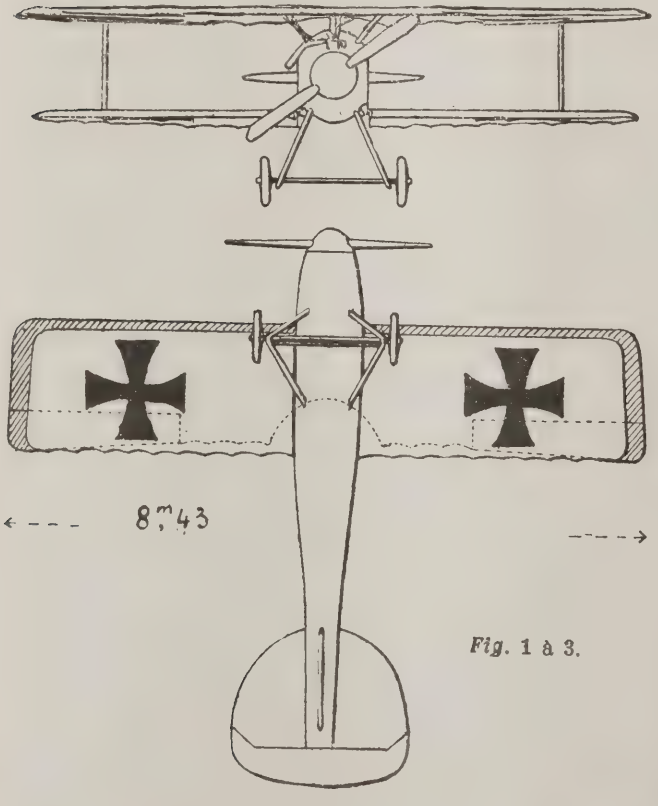
Souvent les carburateurs sont grossièrement entourés de feutre, lié par un fil métallique.

2 radiateurs, épais, de forme trapézoïdale, fixés aux côtés du fuselage.

Echappements se réunissant en une sorte de « corne d'abondance », dirigée obliquement vers le bas, comme sur plusieurs autres biplans de chasse, et non vers le haut comme sur les biplaces.

Les manœuvres de **profondeur** et **d'équilibre** latéral s effectuent toutes deux par un levier Fokker à 2 poignées, bloquables pour la profondeur au moyen d'un parallélogramme de tubes articulés, tout en restant manœuvrable entre les jambes dans le sens transversal.

Palonnier de **direction**, ordinaire.



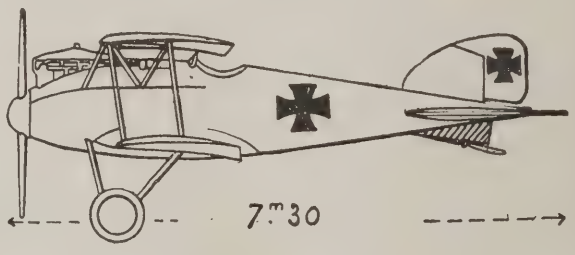


Fig. 1 à 3.

ALBATROS D. II

AILES : Envergure inférieure *presque égale* à la supérieure ; *une seule paire de mâts* de chaque côté ; ailes *ni en V ni en flèche*, presque rectangulaires, avec ailerons débordant en biais ; un peu *déculées*.

GOUVERNES, FUSELAGE et MOTEUR : comme au *D. III* ci-après.

Confusion à éviter : avec les *Spad.*

Les câbles passent presque sur toute leur longueur dans le fuselage ou les ailes.

2 **MITRAILLEUSES** de Spandau, fixes, parallèles, une de chaque côté du moteur, tirant en avant à travers l'hélice, et actionnées par un système Fokker à l'extrémité postérieure de l'arbre à cames.

Elles reposent à l'arrière sur une traverse fixe en tube, au-dessus de laquelle elles sont réglées à demeure.

FOREIGN NEWS

FRANCE

Paris, Oct. 2.—The German cities of Frankfort-on-the-Main, Stuttgart, Treves and Coblenz were bombarded last night by French aviators in retaliation for German aerial attacks on French cities.

Continuing their reprisals for attacks of German aviators on French cities, French aviators on the night of October 2 dropped bombs on the German town of Baden, the War Office announces. The statement follows:

"In reprisal for the bombardment of Bar-le-Duc, two of our aviators dropped several bombs on the town of Baden.

"On the night of October 1-2, and during the day of October 2, our aviators bombarded the railway station at Freiburg, factories at Kolkelgen, and Hoftenbach, and railway stations at Briuelles, Longuyon, Metz-Woippy, Arnaville, Mezières-les-Metz, Thionville, and Sarrebourg. In the course of these various expeditions projectiles to the amount of 7,000 kilograms (15,400 pounds) were dropped."

Paris, Oct. 2.—The government has been invited to place in the Pantheon, where many great Frenchmen are buried, an inscription to perpetuate the memory of Captain Georges Guynemer, the famous French aviator, who was killed in action recently, as "a symbol of the aspirations and enthusiasm of the army." A resolution to this effect was introduced in the Chamber of Deputies by Mr. Lasies.

GERMANY

Berlin.—In the official War Office announcement issued Oct. 3 it was stated that the bombing raid on London, Margate, Sheerness, and Dover by German aviators on Monday, Oct 1, was "visibly effective."

The German military authorities have issued orders that all lights in the Governmental district of Düsseldorf and a great part of Westphalia must be darkened at night, according to the *General Anzeiger*, of Essen. Similar precautions against air raids are being taken at other places in western Germany.

According to the Cologne Gazette, it was Flight Lieutenant Missemann, who since has been killed, who shot down Captain Guynemer, the French aviator. In his last letter to his parents Lieutenant Missemann, according to the newspaper, told them not to be anxious for him, for he never would have a more dangerous enemy than Captain Guynemer.

GREAT BRITAIN

London.—The following official communication dealing with the aerial branch of the army at the front was issued October 1:

"The visibility improved on Sunday, and a great deal of artillery and photographic work was accomplished by our aeroplanes. Bombing continue without respite day and night. More than eleven tons of bombs were dropped on enemy aerodromes at Gontrode and hostile billets and communications in the battle area and on a dump and the headquarters near Cambrai. The enemy also carried out many bombing raids during the night, but did little damage of military importance.

"A photograph taken of the results of our bombing of the Gontrode aerodrome shows that on Saturday night one shed of the aerodrome was hit. The same photograph shows three large German machines which landed in a field five miles south of the Gontrode aerodrome. Two of these machines clearly were damaged, and reconnaissances to-day show all three machines still lying in the field. A large airshflip shed which is now used for the accommodation of Gotha aeroplanes at this aerodrome is reported to have been set on fire last night.

"The enemy aircraft were not very active yesterday, but a few large formations were encountered. Four German machines were brought down and eight driven down out of control. Five of our aeroplanes are missing."

London, Oct. 1.—Nine persons were killed and forty-two injured in last night's air raid, it is announced officially. The statement also announces the bringing down of one hostile machine off Dover, and says British naval air patrols destroyed two enemy machines. A Gotha also was brought down, and is believed to have been damaged. All the British machines are safe.

Sunday night's raid—the fifth within seven days—as far as available details show, accomplished nothing important for the enemy. The claim that the new "air barrage" acts as a powerful deterrent to the raiders seems to have been justified further in the latest attack.

The week-end raids established a record as the noisiest that London has experienced. This was due entirely to the increased number of anti-aircraft guns and the continuousness of the firing.

London, Oct. 2.—Six nights out of the last eight German aeroplanes have crossed the coast and showered bombs over a wide area, while thousands of bursting shells have sprinkled the city with shrapnel.

All London expected another raid to-night and thousands sought early cover in the underground tubes. Others stayed near shelter, ready to seek it at a moment's notice. Up to 10 o'clock, however, London was not raided. There is still a possibility, as the moon does not set until after daylight.

The special volunteer policemen, who have been assisting the regular police since the beginning of the war in emergencies, are receiving shrapnel helmets for protection during air raids. These helmets are similar to those worn in the trenches and hereafter will be a common sight in London. Soldiers on leave and ambulance drivers only have heretofore used them during raids.

London, Oct. 4.—The *Times* announces that 704 aeroplanes and seaplans were brought down or driven down on the western front in September.

This is a higher total by nearly 300 than was reached in August. It compares with 467 in July, 713 in May and 717 in April.

The Allies, according to claims from German headquarters, lost 242 machines last month.

The report of a squadron commander in the Royal Naval Air Service, who has been flying for the last eighteen months on the battle front, tells an exciting story of attacking ten Gotha machines, single handed, 12,000 feet in the air. He fired one hundred rounds behind one of the enemy flyers at one hundreds yards range. After the German machine began a slow spin, the squadron commander fired twenty-five more rounds to make sure of his purpose. His gun then jammed and he became involved in a fast spin, but recovered in time to see his enemy crash on the ground.

The Briton then landed and repaired his machine gun and went up after the remaining Gothas. At 14,000 feet, he engaged two enemy machines in turn, from above and below, finally devoting his attention to one, at which he fired 200 rounds and silenced both its guns and probably hit the gunners. The British flyer, now being out of ammunition, descended.

Another report tells of how two British seaplanes, patrolling above the North Sea, sighted a submarine travelling about fourteen knots with two men in the conning tower. The seaplanes swooped down to a height of 800 feet, one dropping a bomb which burst on the starboard side of the submarine half way between the conning tower and the stern. The submarine slowly keeled to port, the bow arose and the craft began to sink.

The other seaplane then dropped a bomb which burst in front of the conning tower and, as the submarine sank, another bomb was dropped. The seaplanes circled the spot for a quarter hour in search of survivors, but none appeared.

On another occasion a seaplane while on air patrol overheard a hostile wireless signal and soon after sighted a large submarine lying on the surface a mile ahead. Flying at the rate of eighty miles an hour the seaplane darted over the enemy, who fired a round from his foremost gun. The shell burst fifty feet ahead of the seaplane, but the bomb which the British flyer dropped exploded and tore a great hole in the submarine. As the enemy craft sank flames spurted up from the water.

Then three more submarines were sighted, reinforced by three hostile destroyers and two seaplanes. All opened fire on the British seaplane which turned and flew over the spot where the stricken submarine had disappeared. A second bomb was now dropped and its explosion brought up a quantity of wreckage. His supply of bombs being exhausted, the British aviator returned to his base, but first took a photograph of the enemy destroyers and seaplanes.

ITALY

During the night of September 29, Austrian aircraft dropped bombs on Palmanova, Aquileia, Monfalcone and other localities on the Lower Isonzo without doing material damage. One woman was killed.

On the night of October 3 an Italian bombarding squadron, composed of a large number of machines, audaciously flew over the Austrian naval base of Cattaro (southern Dalmatia). The surprised enemy replied by a violent fire which was badly regulated.

Italian aviators on several occasions and with visibly efficacious results hit torpedo boats and submarines lying in the bay.

Rome, Oct. 3.—The official report from headquarters today says: Activity in the air was very lively during the day. One of our squadrons bombarded the railway station of Grahovo. Last night there were two successful raids. Military objectives at Pola were bombarded with four tons of projectiles and badly damaged. Two enemy machines were brought down by our airmen. They fell north of Auzza and near Poldmeletz.

Italy, which has led all other nations in the construction of huge bombing aeroplanes, is now developing a new air terror, the Forlanini dirigible, limited details of which were revealed by Lieutenant Luigi Crescentini of the Italian army, as mentioned on page 195.

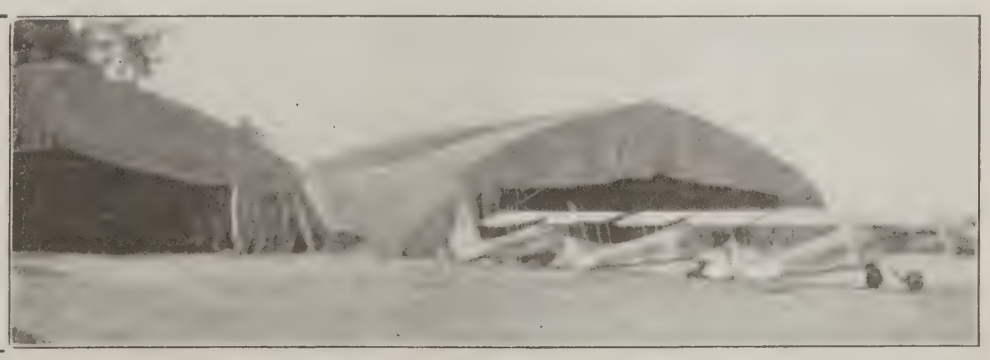
RUSSIA

Petrograd, Oct. 1.—The Russian capital is preparing seriously to resist air raids. Observation posts within a radius of 200 miles have been established. Aeroplane patrols are on duty and arrangements have been made for darkening the city when the approach of enemy aviators is announced by the blowing of sirens.

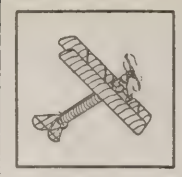
Oct. 3.—German air attacks on Russian Baltic Sea bases and attacks in reprisal by Russian aircraft on enemy camps in Courland are reported in today's official statement.

Oct. 4.—On Tuesday and Wednesday enemy seaplanes repeatedly raided Cerel, Ainazhi and South Pernau on the Gulf of Riga. It has been ascertained that explosions at Cerel October 2 killed seventy and wounded forty-four.

The enemy also raided the village of Krasno, dropping eighty bombs, killing three privates and wounding many.



One of the aviation camps near the battle front in France. Three Spad machines are seen. Note the camouflage on the top of the portable hangars.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th St., New York City
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
LONG ISLAND MODEL AERO CLUB
401 Grant Ave., Cypress Hills, L. I.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Bentwood Propellers

By W. P. Dean.

Very effective propellers can be made from thin maple or birch, steam twisted. Models driven by them have gained world's records. They are lighter, stronger, and more powerful than those carved from the solid. The following directions (from long experience and practice) will enable any boy to turn out his own propellers with satisfactory results.

Confine yourself at first to sizes from 6 to 10 ins. (8 ins. is the most popular). Always make two at a time, right- and left-hand or "twins," by so doing you can check the pitch angle of the blades accurately. Note narrow blades with great twist only require a few strands of rubber to drive them, whilst broad blades with coarse pitch might require double the weight of rubber to obtain the requisite 600 to 1,000 revolutions per minute.

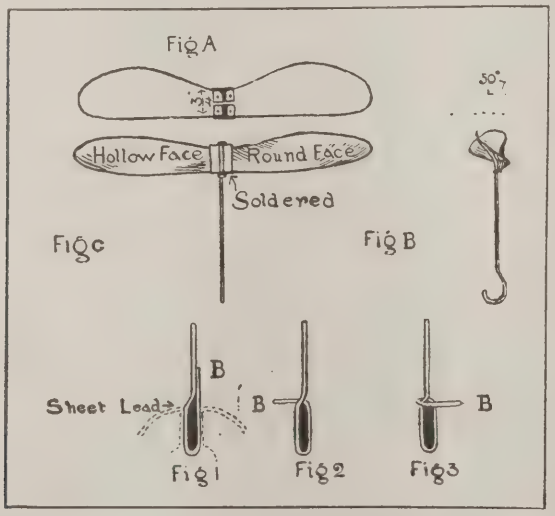
Fig. A shows a very satisfactory shape of blade before twisting.

Fig. B shows end view after twisting, which should be carefully studied during the process. The twin-propeller is twisted in the other direction to that shown. Fig. C finished side view.

The angle of the blade tips should be about 50° with the horizontal as shown.

Select two straight grained pieces of birch 8 ins. long, 1¼ in. wide and barely 1/16 of an inch thick when planed. Cut out both to the shape shown at Fig. A. Obtain two pieces of thin tin 1⅜ in. long and ⅝ of an inch wide. Fold these over at the centre as shown, and punch dents. Now cut off two pieces of 1/16 in. diameter mild steel wire or cold drawn brass wire, 6 ins. long for the shafts. First bend in as at Fig. 1. Then spring in the propeller blank. Hold in position, preferably between the jaws of a small iron vice, lead clamped, as shown by dotted lines at Fig. 1. Now with pliers pull down end B to right angles. Figs. 2 and 3. Then pull it once around the shaft, or twice if preferred, cut off end B close to shaft and file off level. Close up with pliers, and run a little solder on each side, which fixes the shafts firm. Cut off the shafts about 2½ ins. from the spiral, this will allow sufficient length to form the rubber hook end at a later stage, before or after being placed in the propeller bearing fixed on machine. To steam twist the blades dip them into hot water and hold over a candle flame or the steam from a kettle spout. Let the heat of the candle affect the hollow side or the steam the rounded side of each blade, hold the blade in the centre with one hand and twist with the other gradually from near the centre to the tip of the blade. The greatest twisting effort is required near the centre. After obtaining about one-half of the desired twist, turn around and work upon the other half of the blade, again studying your end sketch and twisting as before. Now lay this upon one side and go to work upon the other propeller, which must be twisted in the opposite direction (see end view). See that the entering edges of the blades are on the shaft. Having twisted both blades about half the necessary amount, lay them together end to end, and satisfy yourself that they are correct so far, then leave them for a day or two. A second steaming process will complete them; regulate by further steaming any difference detected later in the pitch. When thoroughly dry give three coats of oak or shellac varnish.

[*Re* shellac varnish, we have had considerable experience with this, and cannot recommend it. It is now being given up even in electrical work; it is hygroscopic, and deteriorates in course of time. A bentwood propeller varnished with it would not, in our opinion, retain its shape; a good boat varnish would be much better.]



Method of Making and Attaching Bent Wood Propellers

A New Zealand Model

From Devonport, Auckland, N. Z., Mr. A. E. Knowles sends us the following particulars of an interesting model which he has built:—

"I am sending, herewith, drawings of a tractor biplane designed and constructed by myself.

"The *fuselage*, which is 3 ft. long, is oval in section. The ribs are steamed to the required shape and are laid on three birch longerons, ⅜ in. by 3/16 in. The front is finished off with a light brass bearing, and the rear is brought to a vertical knife-edge. At the end of this the rudder is hinged. The whole *fuselage* is covered with silk, except where a hole for a pilot's seat is fitted, and enables attention to be given to the front rubber hook, when necessary.

"The chassis consists of a central skid of ½ in. by 1/16 in. bamboo, a compression strut of the same material and a pair of 2-in. disc wheels, supported on a 9-in. axle, made from a cycle spoke. The two V's are made from 16-gauge steel wire. The rear skid is made from bamboo ¼ in. by 1/16 section.

"The main planes, tail, and rudder are made of steel wire and covered with Jap silk. The top main plane has 7 ribs, and is strengthened by a piece of U section steel ribing, running along the front edge for the greater part of its length.

"The propeller is 10 ins. diam. and 15 ins. pitch, and is driven by eight strands of ¼ in. strip rubber. The best flight to date is 72 yards and 31 secs., both being obtained in the same flight, but I hope to get something better from it yet. The above flight was r.o.g."

Note:—Drawings of Mr. Knowles' model will appear in our next issue.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

A Conundrum

I loved a maid in the days gone by
(For her I'd have gone to the divil);
When war broke out a civilian I,
But she said I was hardly civil.

I went to sea as a bold A.B.,
For the life that's free and easy;
No kinder, howe'er, was the maid to me—
She said I was far too breezy.

So thereon I joined the R.N.A.S.,
For I thought 'twould be high and mighty;
But I was still in the same old mess—
She said I was much too flighty.

Now this is the question I put to you—
In a case like that what can one do?
Eat worms in the garden or else get shot?
Or go to a place where girls are not?
I've tried three schemes, and they all fell flat;
Now what can you do with a girl like that?

"Excelsior" Up To Date

The shades of night were falling fast
As to the aerodrome there passed
A youth, with jaw set like a vice,
Who bore aloft this strange device:
Keep Flying.

His brow was glad; his eyes were bright,
Reflected in the starry night!
And as he staggered to his 'bus,
We heard him faintly whisper thus:
"Keep Flying!"

"Beware the Lewis gun that jamms!
Beware the shaky struts and cams
The engine, too, is thick with rust."
"Oh, rats!" the youth replied. "I must
Keep Flying!"

"Try not the flight!" the sergeant pressed.
"'Twill mean 'No flowers, by request,'
And currents roll both deep and wide!"
But loud that clarion voice replied:
"Keep Flying!"

"Oh, stay!" the Flight Commander said,
"The wine in mess flows good and red,
The sherry sparkles, rich and bright!"
A voice replied, far up the height:
"Keep Flying!"

At break of day we started out
And scanned the heavens for his Scout;
And as we whistled through the air
We heard a dulcet voice declare:
"Keep Flying!"

There, in the tree-top, that young coon
Perched like a punctured kite balloon;
And when the ambulance drew nigh
We heard his last despairing cry:
"Keep Flying!"

G. R. S.



TOMMY MAKES THE MISTAKE OF LETTING BABY HOLD HIS KITE WHILE HE GOES FOR MORE STRING

Courtesy Life

"Man's Supremacy."

A pair of wings
Some screws and things
A few wires
Some rubber tires
Motor, propeller and gasoline,
Makes man rule the air supreme.

HARRIET C. WIRTH.

The Sniper

It was the most wickedly cold day of all the wicked winter and freezing iron hard. The Sniping Officer, going his rounds, came upon a Tommy on "Observation Duty," just under the parapet, edging the highest point thereabouts, and overlooking a huge mine-crater in No Man's Land. He had his eye glued to a periscope, and enfiladed, as he was, by a very assassin of a wind, looking the most forlorn, frozen and abjectly miserable object on earth.

"See anything?" inquired the officer.

"See anythink!" Tommy repeated sarcastically, without looking round and unaware that he was speaking to an officer. "Wiv yer blinkin' eyes a runnin', and yer blinkin' nose runnin', and yer blinkin' tin 'at a tumblin' every minute over yer perishin' nose, and the blighted perishcope froze up wiv mid at the bloomin' peep 'ole—'ow the blazes is a blighter to see henythink?"

(Owing to the number of "blinkings," "perishings," etc., in the above yarn, there is no need to mention that the author is our old friend "Herbert.")

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—for instance

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(*Continued from page* 192)

A machine which does not fall within the enemy lines may be rebuilt almost indefinitely, provided there is a sufficient supply of engine parts, planes, propellers, etc., to put it in shape to return. This work can be done with great speed, for it is possible quickly to substitute an entire motor, sending the disabled one to the rear to be rebuilt, if it is not smashed beyond all repair.

In the work of getting machines and parts built the Air Craft Production Board and the Signal Corps have shown great energy and remarkable efficiency.

American inventive genius and mechanical ability have been conscripted right and left, and have responded with enthusiasm.

Wherever there is a factory or shop capable of turning out anything that enters into the manufacture of aeroplanes, it has been utilized. Some of these factories, in remote locations, can make but small and seemingly unimportant contributions, but they are all necessary, and all are kept working to their full acpacity.

The Air Craft Production Board, in order to limit the war profiteer from this vital need of the country, has adopted a ten per cent plus system, under which the manufacturer is paid the full cost of labor and materials and allowed ten per cent as a fair profit. It is possible to check up the exact cost of everything that enters into aeroplane construction, so that there is no way by which any contractor can gain an undue advantage over the Government.

This system is entirely satisfactory to all honest manufacturers. The other kind are not encouraged to do Government work.

In the Signal Corps and the Production Board there have been hearty co-operation and the utmost enthusiasm.

In no other branch of the government service has more been accomplished in so short a space of time.

While the aircraft are building a big army of enthusiastic young Americans is being trained to operate them. This requires a very high degree of skill, and the men for the service must be chosen more carefully and trained more highly than those in any other department of our fighting forces.

The Signal Corps' officers feel confident that when the machines are ready the men will be ready, and that the first blow we strike in the air will be such as to serve notice on the enemy that America is coming into the war in characteristic fashion, and intends to stay in it till her war aims are accomplished.

The future of this great effort is now in the hands of Congress. The first appropriation will soon be expended. The work is being done rapidly but carefully. Motors and all parts have been standardized, so that an aeroplane, built in many sections of the country, can be shipped in parts and assembled in the war zone at the smallest possible cost and at the greatest possible speed.

Congress has never shown the slightest hesitation in providing money for the war necessities of the nation, provided it was convinced that the nation was getting an adequate return for its money.

As far as the aeroplane builders are concerned this assurance can be given.

We believe that every member of both Houses should find out exactly what is being done to justify the original large expenditure, so that when more money is asked it will be immediately granted.

The one way to end the war quickly and with the least expenditure in the blood of our soldiers is to gain and hold a complete mastery of the air. Money will not win any war, but wisely and efficiently expended it will win this one, and there can be no peace until the enemy is convinced that America will win if the war is continued.

AERIAL AGE WEEKLY

Vol. 6, No. 6 | OCTOBER 22, 1917 | 10 CENTS A COPY



The British Astra-Torres Dirigible Starting off on a Patrol on the North Sea. They are Always on the Lookout for U-Boats

NOTICE TO READER

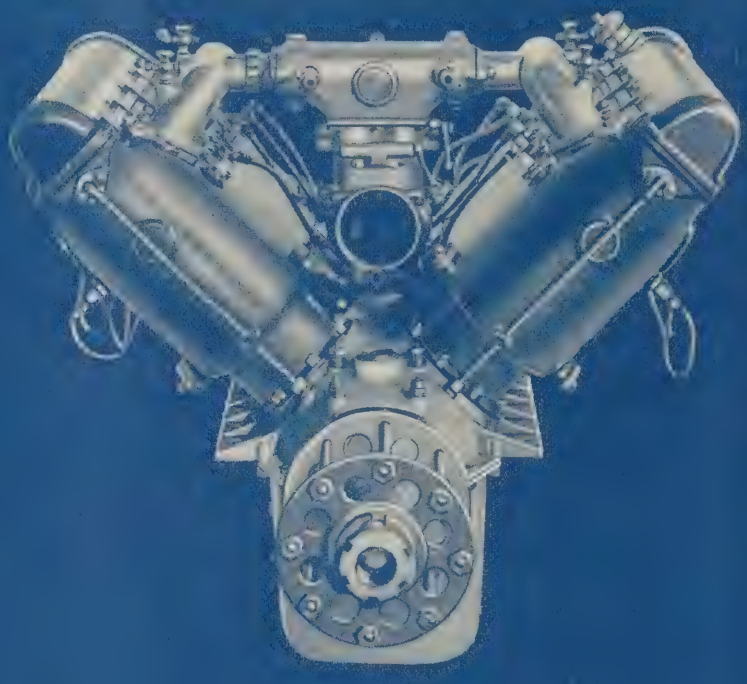
When you finish reading this issue, place a one-cent stamp on this notice, hand same to any postal employee, and it will be placed in the hands of our soldiers or sailors at the front.

NO WRAPPING—NO ADDRESS

A. S. Burleson, Postmaster-General

Aero Club to Present Medals to American Airmen Distinguishing Themselves for Bravery in Europe

Hispano-Suiza



Wright-Martin

New Brunswick, New Jersey, U.S.A.

Aircraft Corporation

G. DOUGLAS WARDROP
Managing Editor

RALPH E. deCASTRO
Absent on Military Service
Associate Editor

GEO. F. McLAUGHLIN
Technical Editor

G. A. CAVANAGH
Model Editor

AERIAL AGE WEEKLY

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WALTER H. PHIPPS
Contributing Technical Editors

THE TRADE AUTHORITY

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VOL. VI NEW YORK, OCTOBER 22, 1917 No. 6

AERO CLUB TO PRESENT MEDALS TO AMERICAN AIRMEN DISTINGUISHING THEMSELVES FOR BRAVERY IN EUROPE

WITH the warm approval of President Poincaré of the French Republic and of General Pershing, the Commander in Chief of the American Forces in France, the Aero Club of America, through its Foreign Service Committee, of which Ambassador William G. Sharp is Chairman, has started its energetic activities in France along most helpful lines which will help to promote the efficiency and personal welfare of the American aviators in France and other important purposes.

The sum of $10,000 was voted by the Executive Committee of the Club to carry out this work, the most important phases of which are given in the following letter sent to President Wilson by Mr. Alan R. Hawley, President of the Aero Club of America.

Mr. Hawley's letter to President Wilson follows:

"My dear Mr. President:

"As Commander-in-chief of the Air Forces you may be interested in knowing that the Executive Committee of the Aero Club of America today authorized the carrying out of the plans drawn by its Foreign Service Committee, of which Ambassador Sharp is Honorary Chairman, and whose work has received the approval of President Poincaré of the French Republic and of General Pershing, the Commander-in-chief of the American Forces in France. The sum of $10,000 has been set aside for this work.

"Among the important things which the Foreign Service Committee recommended be done by the Aero Club of America are:

"(1) The creation of a 'Medal of Merit and Honorable Distinction', in bronze, silver and gold, to be awarded to American and Allied aviators for acts of heroism and for meritorious achievements in the field of aeronautics.

"Following the precedent established by Act of Congress of October 16, 1787, which provided that the gold medal awarded to Captain Paul Jones be executed in France, by the eminent French artist Dupré, under the supervision of the Hon. Thomas Jefferson, Minister Plenipotentiary of the United States at the Court of Versailles—and also in the case of the medal awarded to General Lafayette—the proposed medal is to be designed in France, by Monsieur Pierre Roche, one of the most eminent French artists and medallists.

"This medal will be awarded to every man recommended for same by the Commanders of the American Military and Naval Forces in Europe, and by the Commanding Officers of the Army Air Service and Navy Air Service of the United States.

"(2) The establishing of a 'Service and Information Office' in Paris to assist members of the American Air Forces in every way possible. The members of this Committee, being all prominent people, who have resided in France for a number of years, are able to guide members of the air services who go to France and prevent their getting into such trouble as a number of American aviators got into recently when, through ignorance of condition, language and money equivalents, went to most expensive hotels and spent their limited funds in a few days, although living the simplest kind of life. To avoid a repetition of this trouble the Foreign Service Committee has compiled a list of hotels in Paris and other French cities, with their rates, and other details of value to people unfamiliar with conditions in France.

"This is only an example of the many practical services which our Committee can render to the members of our aerial forces. Another service already rendered has been the sending of aeronautic literature to a number of aeronautic centers where Americans are trained, and places where they meet and supply cigarettes and other things which contribute to their personal welfare.

"In this connection, I take pleasure in mentioning that the Duke of Talleyrand and the Duchess of Talleyrand (nee Anna Gould) have very generously extended their patriotic hospitality at their splendid Château to a number of convalescent American aviators.

"Mr. Poincaré, President of the French Republic, who very generously accorded a reception to the Foreign Service Committee and expressed to the Committee his appreciation of the Aero Club of America and his interest in the work which the Club is doing in France, has very graciously confirmed his expressions in a letter to me just received, signed by the Secretaire General Civil de la Presidance de la Republique de France.

"Our Committee is cooperating closely with the Aero Club of France, with which we have been affiliated and have cooperated since 1905. Also with the Aerial League of France, the American Red Cross in France, the American Army and Navy Y. M. C. A. in France and other organizations.

"Its aim being to do whatever is not already being done by other organizations, the Committee acts as a clearing house for aeronautic service and relief. Through its affiliation and close co-operation with the thirty affiliated aero clubs, the Aerial League of America, the National Special Aid Society, the Aero Club of America is enabled to prevent duplication of efforts in promoting the welfare of the members of the American Air Services in France.

"Assuring you that we consider it a privilege to be of service and trusting our humble efforts meet with your approval, I beg to remain,

"Yours very sincerely,

"(Signed) ALAN R. HAWLEY,

"President Aero Club of America."

100,000 Aero Mechanics Needed

Machinists, electricians, carpenters and men familiar with gasolene engines, attention! Uncle Sam wants you. One hundred thousand men, between the ages of 18 and 45, who have not been summoned to appear before the local draft board are needed to be the men behind the men in the aeroplane.

Uncle Sam sends the word out through Major-Gen. George O. Squier, chief signal officer of the army, that the men are very much needed. The men wanted are not those who want to fly, but men who are familiar with gasolene engines, or who are machinists, electricians or carpenters. They should enlist as privates for the aviation section of the Signal Corps and will be attached to the aeronautical squad whose business it will be to keep the aeroplanes in repair. Applications can be made to any recruiting office in the United States.

The New York city headquarters of the U. S. A. Aeronautical Corps (Eastern Division) is at 104 Broad street and is open daily except Sunday.

Helping Aircraft Plans

(Editorial in N. Y. *Times*)

THE approval bestowed on the Manufacturers' Aircraft Association by Attorney General Gregory, who has held that the combination of aeroplane and motor builders is not in violation of the Sherman anti-trust law, was a necessary step in completing the efficient organization of the nation's aviation industry essential to the fulfillment of our ambitious aerial program, now already well begun. It might have been foreseen, and in fact was, by keen observers, because of the acceptance by Major Gen. George W. Goethals of the presidency of the Wright-Martin Aircraft Corporation. Association by the builder of the Panama Canal with one of the two chief members of the aeroplane combination carried conviction that the association had full governmental sanction.

Nevertheless, official recognition was needed, if only to clear the atmosphere of the haze which had surrounded the creation of the Manufacturers' Aircraft Association. The body was a development of an earlier organization, the Aircraft Manufacturers' Association, which, comprising the leading makers of aeroplanes in this country, was formed some months ago to facilitate intercourse between the Government and the industry at a time when the program later developed by the Government's Aircraft Production Board was just taking shape. The necessity to avoid the patent litigation which had harassed the progress of the aviation industry in the past was realized at once, and repeated conferences between the makers and the heads of interested departments in Washington, including the National Advisory Committee for Aeronautics and the Aircraft Production Board, resulted in the formation of the new association, the members pledging themselves to an exchange of patent rights under a royalty plan. Announcement of the new organization was made by the makers themselves, however, and failure of the Administration to proclaim its sanction of the new body left it open at once to attack as a combination in restraint of trade.

Until its status was definitely established, therefore, the association encountered opposition in many quarters, and the success of the whole Government endeavor in the field of aerial preparedness was threatened, inasmuch as its fulfillment was predicated on certain work by the established industry in addition to that which the Aircraft Production Board has been enabled to develop in allied fields. By his ruling on the legal standing of the association Mr. Gregory has now removed the last obstacle to the speedy and successful completion of this country's $700,000,000 aviation program.

Big Aeroplanes Needed

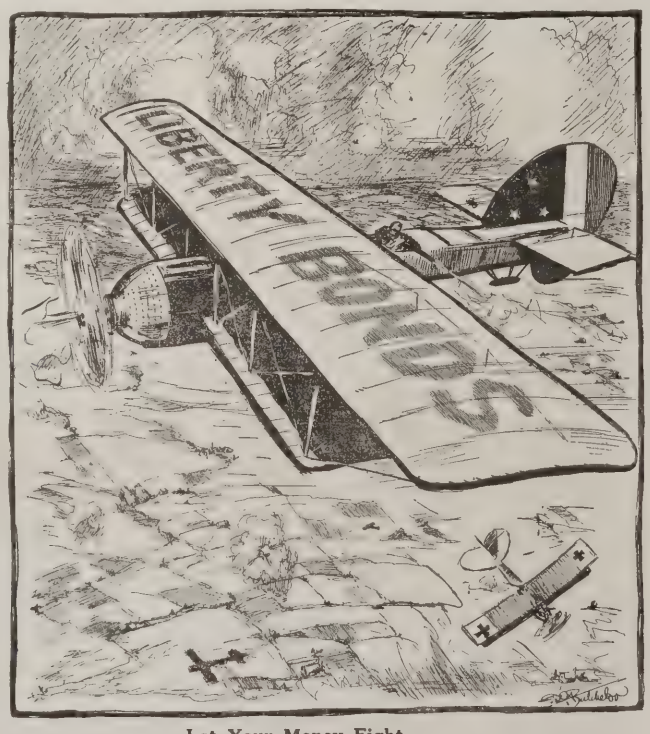
(Editorial in N. Y. *Times*)

AMONG those who do not believe that the German air raids on London are inspired solely by some peculiarly Teutonic desire to inflict on the noncombatant part of Great Britain's population the punishment which the fighting forces have declined to take except on terms of immediate repayment with interest, there is an expanding concurrence in the theory, first cabled to this country by Mr. Grasty in a dispatch to The New York Times, that Germany is preparing for an aerial investiture of London on a scale not yet attempted in the overhead activities of any of the warring nations. There have been indications in plenty that this is a sound theory, and the attack last Friday night contained its own bit of testimony in support of it.

The dispatch to The Times referred to the raiders as "moonlight visitors" and again spoke of the condition of the sky as being "not altogether favorable for night flying." The enemy aeroplanes were clearly visible, as they have always been in the past, not only to the defenders who mounted into the air at the first alarm but to the gunpointers of the anti-aircraft batteries which surround London. Two of them were shot down. Yet the raiders might as easily have selected a night moonless and made dark by storm clouds: there was no apparent necessity for making their attack on Friday night.

The explanation lies in the theory of a tremendous attack, as yet only in prepartion. Military experts of the air, among them officers of the British Royal Flying Corps, have expressed themselves as satisfied that the raids are made by moonlight so that the raiders may have a clear view of London and its environs, so that they may learn the air path which must be followed from the German base most quickly to reach a strategic post over England's capital. And they are satisfied, too, that in each raid the personnel of the enemy squadron is different, with, perhaps, a leader or two who have made the journey before, to show the way. They see Germany, with characteristic persistence and disregard of relatively small losses, slowly training a company of airmen whom she may launch at London in a single tremendous squadron of two or three hundred aeroplanes.

What preparation England is making to offset this danger has not, of course, been announced, but it is fair to guess that the British aeroplane plants are hurrying huge machines to completion. It has been officially stated that the ordinary type of warplane on which both English and French have heretofore centred their constructive efforts is no match for the huge Gothas of Germany which carry three airmen each and three machine guns so mounted that the former sought-for position of attack—the "under-the-tail" position—has become no longer an advantage, but an actual menace to the airman obtaining it.



Let Your Money Fight. (*Courtesy N. Y. Journal*)

Alone among the Allies the Italians have built machines structurally capable of meeting the raiding Gotha on even terms. Members of the Royal Flying Corps of Italy have brought several such machines to this country. It was one of them in which ten men flew from Langley Field to Washington a little more than a week ago. The flight was designed to give an idea of what Italy can do with the giant 'planes on which she specializes. Italy wants aeroplanes and aeroplane parts; she wants motors and spruce and she wants the United States to furnish them. America's new Liberty Motor can be fitted exactly to Italy's needs and, thanks to its standardization, it can be produced in quantities impossible to attain under Italian methods of construction.

There should be no other argument needed to persuade the United States to assist her ally in the construction of more and greater Capronis. If there were, however, London's unhappy situation should supply it.



THE NEWS OF THE WEEK



War Pool of Aero Patents Held Legal

Washington, Oct. 11th.

Legal approval has been given the agreement between the aircraft prodution board and the airplane manufacturers' association, clearing away a possible serious obstacle to the government's $640,000,000 aircraft program. Attorney General Gregory has held that the patent pooling plan to prevent patent litigation does not violate the Sherman anti-trust law.

The effect of the opinion ratifies all the work done by the aircraft production board and the advisory committee for aeronautics, and insures the employment of the entire aeroplane production capacity of the country.

Details of the pooling agreement have not been made public by the government, though much has been printed about it. In general terms it provides for the pooling of the Aeroplane Manufacturers' Association of the basic aeroplane patents known as the Wright and Curtiss patents, and of all other aeroplane patents now held or to be developed hereafter by the association. The organization is open to any builder or patentee on payment of nominal association fees.

Provision is made for royalty payments of $200.00 per machine, this is a reduction of about one-fifth (1/5) of the amount asked by the patent holders before the plan was worked out. With the exception of $25.00 assigned to maintain the association, the royalty goes to holders of controlling patents. A maximum limit of $2,000,000.00 has been fixed, for each of the Wright and Curtiss claims. Holders of any future controlling patents who are members of the association will share in royalties to be determined later.

This is a substitute plan that has been worked out by the advisory committee for aeronautics for that proposed in the act of Congress appropriating $1,000,000.00 for Government purchase of basic aeroplane patents and authorizing condemnation proceedings if necessary.

The royalty being charged against manufacturers' profits in cases where Government contracts are based on the cost plus profit plan, as most of them now are. All foreign or private orders also pay their share of the royalty and the effect of the whole scheme has been to reduce the pre-war cost of aeroplanes to the Government by fifty per cent, with the probability that it will be later, owing to quantity production contracts, reduced fifty per cent more as the work progresses.

New Marmon Factory

Indianapolis.—The Nordyke & Marmon Co., which has a contract for manufacturing aeroplane motors for the United States Government, will make additions to its plant to cost about $120,000. This makes the third large addition built during the last three months.

Liberty Bond Aerial Raids

Washington, D. C.—A coast-to-coast aerial rail on hundreds of cities will be made by army flyers in aeroplanes and balloons on Oct. 20 in behalf of the second Liberty Loan. Details were completed by the War Department.

At an appointed hour forty-five aviators and eight balloonists, armed with paper bombs, will ascend for flights ranging from fifteen to 146 miles between army flying camps where the "eyes of the army" are in training, and surrounding cities.

As cities, villages and towns are passed over hundreds of red, white and blue paper bombs, containing Liberty Loan literature, will be dropped. On each municipality also will be dropped one large red bomb, to which will be attached a long ribbon, containing a special message for the mayor. This bomb, by special arrangements now being made by the Treasury and War Departments, may be handed to mayors direct by the finder, or given to any policeman who will deliver it to the mayor's office.

Aeroplanes will carry from 150 to 175 pounds of bombs apiece. The balloons will carry as high as 400 pounds of bombs.

The most scientific and daring aviators and balloonists from the different camps will be selected for the flights. Applications for the honor of flying in behalf of the loan already are coming in to the War Department. Besides dropping the bombs, the flyers doubtless will give brief exhibitions above every city over which they pass.

All of the flights probably will start at the same hour. If a starting time is fixed, it will be announced later.

The complete schedule of flights follows:

Hazleton Field, Mineola, L. I.—Two aeroplanes to Camp Upton via Yaphank; two to Jersey City, via New York City and Governors Island.

Langley Field, Hampton, Va.—Three aeroplanes to Norfolk via Newport News; two to Richmond.

Wilbur Wright Field, Fairfield, Ohio—Four aeroplanes to Cincinnati via Dayton; two to Fort Benjemin Harrison via Indianapolis, and two to Columbus, Ohio.

Scott Field, Belleville, Ill.—Four aeroplanes to East St. Louis, Ill., via St. Louis and Jefferson Barracks; two to Springfield, Ill.

Chanute Field, Rantoul, Ill.—Two aeroplanes to Fort Sheridan, via Chicago.

Selfridge Field, Mount Clemens, Mich.—Eight aeroplanes to Detroit; two to Camp Custer, via Battle Creek.

Post Field, Fort Sill, Okla.—Two aeroplanes to Oklahoma City.

Kelly Field, San Antonio, Tex.—Four aeroplanes to Camp McArthur, via Austin and Waco.

Rockwell Field, San Diego, Cal.—Four aeroplanes to Pasadena—via Linda Vista, Camp Kearney and Los Angeles.

Five balloons will fly over St. Louis and three will ascend in Omaha. One balloon will fly from Omaha to Des Moines and two other captive balloons will be sent up for local flights. Fort Omaha, Fort Des Moines and Camp Dodge will be visited by some of the balloonists.

Local committees all along the route are expected to arrange celebrations and separate attractions for the date of the flight.

Signal Corps Needs Stenographers

The Aviation Section of the Signal Corps needs 100 first-class stenographers and 100 clerks for immediate service abroad. Only men with excellent references will be considered for this special work. Applicants from 30 to 35 years of age are preferred. These men will be enlisted as first-class privates, but three-fourths of the number will be made non-commissioned officers. Applications may be filed at the office of the Military Training Camps Association, 19 West Forty-fourth Street, where an officer will conduct the personal examinations.

Aeroplane Attraction of Electrical Show

Through the progressiveness of the Signal Corps advantage was taken of the opportunity offered by the Electrical Exposition in Grand Central Palace to the show the thousands of visitors something of aeronautics, and consequently permission was given the Standard Aero Corporation to exhibit one of their machines. The exhibit proved to be one of the greatest attractions of the exposition.

Wardrop Lectures at Syracuse

At what was stated to be one of the largest meetings the organization has held, G. Douglas Wardrop, editor of AERIAL AGE, was the principal speaker at the meeting of the Onondago Historical Association at Syracuse on October 12th. The members were keenly interested in Mr. Wardrop's lecture and several prominent citizens afterwards expressed a desire of stimulating local interest in the industry to the end that Syracuse should become prominently identified with it.



Aerial Coast Patrol Unit No. 2, all of whom have qualified at Buffalo. Harold F. Kantner was the instructor

Offer Sunbeam Rights to Government

Washington.—The American rights to the manufacture of the British Sunbeam aeroplane motor have been offered at cost to the Government. The offer was made to Secretary of the Navy Daniels by A. P. Homer of Boston, A. W. Church and George C. Beach of New York. These men will turn over the rights, for which they will be paid $3, $1 apiece, to make the transaction legal.

The U. S. Government, if it accepts the offer, will have to pay exactly as much as the British Government does in royalties. The British Government is building the Sunbeam motors under the license plan. The United States will also have the right to all improvements in the motor developed abroad.

The offer is open for 30 days to permit of investigation and will continue in force only until the war is ended.

Officers Club at Wilbur Wright Field

Officers Club at Wilbur Wright Aviation Field, was formally dedicated by a smart military ball, complimentary to Major and Mrs. Arthur Christie.

In the receiving line were Lieutenant Colonel George M. Bonford, the new commandant; Major and Mrs. Arthur Christie, Captain McCalley, and officers of the post. It was an unusually pretty party enjoyed by the officers and their friends, the company numbering some 140 persons. Music for the dance numbers were furnished by the Becker-Bott orchestra and a buffet supper served.

During intermission, cornet solos were played by Frank Simon, former cornet soloist with Sousa's band, now organizing a band at the field, who was accompanied by Mrs. Charles F. Kettering at the piano. Mrs. Harry E. Talbot sang a group of songs as did Mr. Winch of the 43rd squadron.

Three Airmen Return to U. S. From Front

Sergt. Archibald Johnson of Pittsburgh, a member of the Lafayette Escadrille, has returned to America. He gave an account of the daring of French airmen in attacking Germans in the air. Johnson is a Cornell graduate and went to France to drive an ambulance, but soon took up aviation. Although he has been in the fighting air service less than a year, he has brought down three German aeroplanes.

The other members of the Lafayette Escadrille to return were James Doolittle of New York and Mark Leslie Hull of Mamaroneck. Hull had both his legs broken when his machine landed in a forest. He expects to have one of his legs amputated here and with an artificial limb return to the front.

Doolittle's most exciting experience was when he found a British captive balloon under fire from a German battery. He dropped enough bombs on the battery to silence it and covered the descent of the balloon. For this feat he was awarded the British military cross. Johnson has won the French war medal.

U. S. Scientists Evolve New Aero Lubricant

Scientists of the Bureau of Mines and Bureau of Standards, working in co-operation with the corps of scientists connected with the Council of National Defense, have evolved a new lubricating oil which will prolong the life of aeroplane motors.

The new oil has been fully perfected, and is now being used on the Liberty motor, and will be available, as soon as refining facilities can be extended, to furnish lubricant for the aeroplane motors of all the allies.

The oil is designed primarily for aeroplanes, though it may also come into use for automobile motors. The composition of the new oil is being held secret for the present.

Aviation Officer Sent to End Coast Strikes

Washington.—Major Keith McLeod, of the aviation section, Signal Corps, has departed for Seattle to represent the Aircraft Board in settlement of labor disputes on the Pacific coast.

Major McLeod will investigate at once conditions affecting the production of spruce lumber urgently needed to carry out the aeroplane programme.

Don McGee Has Fatal Fall

Detroit.—Don McGee, of Saginaw, Mich., a civilian instructor at Selfridge aviation field, near Mount Clemens, lost his life in Lake St. Clair, when his aeroplane plunged into the lake from a height of 3,000 feet.

McGee attempted a nose dive, but his machine failed to right itself and plunged in nose first.

Nickel Trust Head Flying Corps Colonel

Ambrose Monell, president of the International Nickel Company, has tendered his resignation to devote his time to promoting aviation.

Mr. Monell will accept a commission as colonel on the staff of General Foulois, of the American aviation forces. He will go abroad in about six weeks.



News from home! Some of the American fliers, "Somewhere in France," enjoying their favorite paper "Aerial Age."

Government's Activities in Aeronautics

In a statement in the *Official Bulletin*, the following paragraphs concerning aeronautics appears:

Development of "Liberty Motor"

Development of the "Liberty motor," which has withstood every aviation-engine test, is one of the major achievements of the War Department and the Aircraft Production Board. This was followed by the designing of a standard military truck. Then came the letting of contracts for a great aerial fleet, authorized in the $640,000,000 aviation appropriation bill. This aviation program calls for more than 20,000 aeroplanes, ranging from light training machines to great battleplanes. Aviation experts from the allied countries are in Washington and help to form an "international general staff on aviation."

Many obstacles have been overcome by both the Ordnance Bureau and the Quartermaster Corps. Each division is spending more than $3,000,000,000 for the equipment of the new Army. American industry was forced suddenly to expand to meet war orders for ammunition, guns, clothing and supplies. It has responded well. The Ordnance Department organized a special section to handle the problem of supplying our soldier with weapons essential to modern trench warfare, such as hand grenades, trench motars, and drop bombs.

Flying Schools Authorized

Twenty-four flying schools have been authorized for training aviators in this country, and the majority of them are in operation. There are eight ground schools. Many American aviators are now receiving intensive training behind the battle fronts.

Battery to Guard Against Aircraft

The veteran Corps of Artillery, Col. John Ross Delafield commanding, has been designated to replace in New York the Federalized 9th Coast Defense Command, National Guard. Anti-aircraft batteries will be organized as soon as the regiment is settled at its future home, the 9th Regiment Armory, No. 125 West 14th Street.

Among the officers who are making a special study of this military duty is First Lieut. Cabot Ward, New York's Park Commissioner. He is now in France with the United States Anti-Aircraft Commission analyzing methods of combating air raiders. The vessel upon which he crossed the Atlantic was chased by a U boat, which fired several shells.

Last summer Lieut. Ward served "in the field" here with a provisional battalion of infantry organized from the Veteran Corps and did sentry duty along the Catskill Aqueduct.

The members of the Veteran Corps, which will be known hereafter as the 9th Artillery, New York Guard, plan that the anti-aircraft ordnance shall be provided by subscription of its members. The batteries will have opportunities for practical drills at isolated points along the coast. At the same time the big-gun batteries will go on tours of duty at local forts where officers and men will get instruction.

Among the members of the Veteran Corps—or the 9th New York Artillery are:

Charles A. Van Rensselaer, Ralph C. Dunne, manager of the Cheltenham Press; Frederick K. Trask, head of Spencer Trask & Co., Charles F. Gould, W. W. Bruce, A. E. Crockett, all well known in the banking world; J. W. Goodwin, lawyer; John Ward Dunsmore, the painter; Frederick Cauchois, Theodore P. Pell, W. J. Kingsbury, D. M. Sarkisian, George Schwab, Brother of Charles M. Schwab, and John Rogers, lawyer.

Others are Robert Olyphant, banker and President of the Sons of the American Revolution; James M. Montgomery, the Rev. James Henry Darlington, Charles Elliott Warren, bank President and an expert on ordnance; James J. Wardrop, Wardrop-West African Steamship Line; J. S. Phelps Stokes, Lathrop Colgate, the Rev. Dr. Clarence Manning, the Rev. Dr. Charles E. Brugler, T. J. Oakley Rhinelander, Richard C. Tiffany, Harry Howard, actor; Johnny Eagan, marble cutter; George H. Riley, theatrical manager; Eugene R. Verdun, publisher; W. H. Brown, tea and coffee merchant; E. H. Emmons, editor; William L. Hodges and Gabe Casell, a former Texas Ranger.

J. R. McConnell Officially Honored

The following bill authorizing the Secretary of War to donate to the State of North Carolina two brass cannon with carriage, and introduced by Senator Overman, was passed on Sept. 26 by the United States Senate:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and is hereby, authorized and directed to donate to the State of North Carolina two brass or bronze cannon, with carriage, and suitable outfit of cannon balls, condemned or not needed for present service, to be placed at the foot of the monument now being erected at Carthage, North Carolina, in honor of James R. McConnell, an American aviator, who was killed while flying for France.

NAVAL and MILITARY AERONAUTICS

Signal Corps Appeals for Lenses for Aircraft Cameras

The Chief Signal Officer requests that the widest publicity possible be given the following appeal:

People of the United States are asked to help the Signal Corps of the Army get lenses enough for cameras for the fleet of observation aeroplanes now being built. The need is immediate and of great importance; the aeroplanes are the eyes of the Army and the camera lenses are the pupils of those eyes.

German lenses can no longer be bought in the open market. England met this difficulty in the earlier stages of the war by requiring lens owners to register lenses and requistioning those needed. The Bureau of Standards of the United States Department of Commerce is now perfecting a substitute for the German "crown barium" glass used for lenses and will later be able to meet the needs, and special lenses are being designed for this work.

The situation now, however, is that, with aeroplanes soon to be ready for service, suitable lenses cannot be bought. Hundreds are needed at once. Possessors of the required types are urged to enlist their lenses in the Army. They are asked immediately to notify the photographic division of the Signal Corps, United States Army, Mills Building Annex, Washington, D. C., of lenses of the following descriptions which they are willing to sell, stating price asked:

Tessar anastigmat lenses, made by Carl Zeiss Jena, of a working aperture of F. 3.5 or F 4.5, from 8¼ to 20 inches focal length.

Bausch & Lomb Zeiss tessars, F. 4.5, from 8¼ to 20 inches focal length.

Voigtlander Heliar anastigmat lenses, F. 4.5, 8¼ to 24 inches focal length.

Y. M. C. A. Dedicated at Wilbur Wright Field

Congressman Simeon D. Fess was the principal speaker at the dedication ceremonies of the Y. M. C. A. building at the Wilbur Wright aviation school. He discussed the cause of America in the world war, the important part that aeroplanes will play and the work that the Y. M. C. A. is doing at the army camps.

Nearly two thousand basket dinners were served for the aviators and guests of the Y. M. C. A..

The presentation address was made by E. L. Shuey, of Dayton, who formally presented the building to the aviation authorities. The speech of acceptance was made by Captain McCally of the Forty-third Aero squadron.

Aircraft Board Will be Named

President Wilson is expected to announce the personnel of the Aircraft Board in the course of a few days. This board will consist of three civilians, including the chairman, the Chief Signal Officer of the army and two other army officers, the Chief Constructor of the navy and two other naval officers.

Howard coffin, who has been in charge of the aviation section of the Council of National Defence, is expected to be named as chairman of the new board.

Considerations of governmental strategy necessitate withholding an account of the extent to which the progriamme of this branch of the service has been conducted, but when the story is told it will mark another achievement of American industry and ingenuity that is without parallel in the annals of this war.

To Train Army Aeroplane Mechanicians

To fit the vast army of aeroplane mechanicians needed to care for and build the air fleet which the American army is to have, a school for instruction in the mechanical construction, care and repair of the aeroplane engine and the plane itself is to be opened in New York. It will be conducted by the West Side Young Men's Christian Association, of 318 West Fifty-seventh street, as a part of its "war bit," a building having been leased near the branch to accommodate the new school.

The enterprise has the backing of the Aero Club of America. None of this class will actually fly, but will care for the planes, and it requires about ten mechanicians for every flyer. Besides this, many men will be needed in the factories where the aeroplanes which the United States is to send to the war front are to be built.

The instruction consists of fifteen three hour lessons in the construction, operation, care and repair of aeroplane engine, with practical work following the period of instruction, so that students will have to handle every part of an engine, be able to put the parts in place and repair them if needed. Then there will be fifteen three hour lessons in plane construction and repair, where the men will learn not only the theory but will actually build, or assemble planes, replace broken parts and learn how to detect hidden faults.

Without an announcement having been made, there are enough applications on file to almost fill the first classes, coming from those who have been recommended by the aero men. Mr. F. S. Gostenhofer, who has an extended experience in automotive engine operation, will be in charge of the new school and will have a competent corps of instructors. The cost will be just enough to cover expenses, the Y. M. C. A. assuming all overhead charges from patriotic motives.

Liberty Truck, to be Given Test Run by Army

Lima, Ohio.—Preparations are being made for an early test run to the East, probably to Washington, of the first Liberty motor-truck, just completed here. The truck, which carries a load 1,000 pounds greater than any similar truck, is the result of months experimenting by some of the leading motor and truck builders in the country. The Government has ordered 35,000 to be built in the first six months of 1918 for use by the Army. It will not be used for commercial purposes.

The first truck, which was built here, was assembled in a factory without windows or doors and entered from a skylight. The greatest secrecy was thrown about it. Similar precautions were taken in the sixty or more factories which manufactured certain of its parts.

Army Aeronautics

The following named Officers, S.O.R.C. relieved from duty Camp Borden, Canada, and ordered to Fort Sill, Oklahoma, for duty at School for Aerial Observers:

Second Lieuts. Philip B. Buzzell, Benjamin W. Estabrook, Newton S. Frothingham.

First Lieut. Eugene B. Jones, Av. Sec., S.O.R.C., to active duty Hazelhurst Field, Mineola, Long Island, New York.

The following named Officers, S.O.R.C., from duty Signal Corps Training Camp, Fort Leavenworth, Kans., to Camp Sherman, Chillicothe, Ohio, reporting to Commanding General, 83rd Division, for duty with 308th Field Battallion: Major Gustave Hirsch, Commanding Officer, Capt. Clyde E. Wiley, duty with Company A, Capt. George W. Dickerson, duty with Company B, First Lieut. James G. Pierson, Adjutant and Supply Officer, First Lieut. Edward C. Lay, duty with Company C.

Following named Officers, S.O.R.C., relieved



An interesting view of the latest French Spad. British official photograph.

from duty Signal Corps Training Camp, Fort Leavenworth, Kans., to Camp Taylor, Louisville, Kentucky, reporting to the Commanding General, 84th Division, for duty with 309th Field Signal Battallion:

Capt. Frank L. Shuman, duty with Company B, First Lieut. Frank A. McGann, Adjutant and Supply Officer, First Lieut. Ralph K. Bonell, duty with Company A, First Lieut. Donald H. Robinson, duty with Company B, First Lieut. Lewis P. Bransford, Jr., duty with Company C.

Following named Officers, S.O.R.C., from duty Signal Corps Training Camp, Fort Leavenworth, Kans., to Camp Custer, Battle Creek, Michigan, reporting to Commanding General, 85th Division, for duty with 310th Field Signal Battalion: Major Edwin O. Baker, Commanding Officer, Capt. Frank A. Marvin, duty with Company B, Capt. Keene Richards, duty with Company C, First Lieut. Albert S. Batterman, duty with Company A, First Lieut. Robert L. Taylor, Jr., duty with Company C.

The following named Officers, S.O.R.C., from duty Signal Training Camp, Fort Leavenworth, Kans., to Camp Grant, Rockford, Illinois, reporting to Commanding General 86th Division, for duty with 311th Field Signal Battalion: Major Claire W. Shands, Commanding Officer, Capt. Charles R. Welsch, duty with Company B., Capt. Samuel R. Todd, duty with Company C., First Lieut. William A. Bertrand, Adjutant and Supply Officer, First Lieut. Clay I. Hoppough, duty with Company A.

The following named Officers, S.O.R.C., from duty Signal Training Camp, Leon Springs, Texas, to Camp Pike, Little Rock, Arkansas, reporting to Commanding General 87th Division, for duty with 312th Field Signal Battalion: Capt. Walton D. Hood, Commanding Officer, First Lieut. Alexander G. Conoley, Jr., Adjutant and Supply Officer, First Lieut. Leo McMahon, duty with Company A, First Lieut. Guy H. McClure, duty with Company D, First Lieut. Jesse T. Robertson, duty with Company C.

The following named Officers, S.O.R.C., from duty Signal Corps Training Camp Fort Leavenworth, Kans., to Camp Dodge, Des Moines, Iowa, reporting to Commanding General 88th Division, for duty with 313th Field Signal Battalion: Capt. Leon W. Ainsworth, duty with Company A, Capt. Lynne E. Mason, duty with Company B, Capt. Payson D. Foster, duty with Company C, First Lieut. David Maxwell, Adjutant and Supply Officer, First Lieut. Edwin H. Welch, duty with Company A.

The following named Officers, S.O.R.C., from duty Signal Corps Training Camp, Fort Leavenworth, Kans., to Camp Funston, Fort Riley, Kans., reporting to Commanding General, 89th Division, for duty with 314th Field Signal Battalion: Capt. Paul P. Brinkman, duty with Company A, Capt. John R. Ruddick, duty with Company B, Capt. George F. Plant, duty with Company C, First Lieut. Charles O. Van Der Vort, Adjutant and Supply Officer, First Lieut. Fred J. Payson, duty with Company C.

The following named Officers, S.O.R.C., from duty Signal Corps Training Camp, Leon Springs, Texas, to Camp Travis, Fort Sam Houston, Texas, reporting to Commanding General 90th Division, for duty with 315th Field Signal Battalion: Capt. Charles F. Everitt, duty with Company A, First Lieut. James A. Burton, Jr., Adjutant and Supply Officer, First Lieut. Fred G. Gardner, duty with Company A, First Lieut. John Donhouser, duty with Company B, First Lieut. John H. Graham, duty with Company C.

The following named Officers, S.O.R.C., from duty Signal Corps Training Camp, Presidio of Monterey, California, to Camp Lewis, American Lake, Wash., reporting to the Commanding General, 91st Division, for duty with the 316th Field Signal Battalion: First Lieut. Jesper S. M. Quist, First Lieut. James C. Meece, First Lieut. Duncan E. McKinley, First Lieut. Geo. P. Dixon, First Lieut. Albert M. Taylor.

The following named Officers, from duty Signal Officers Reserve Corps, Signal Corps Training Camp, Leon Springs, Texas, to Camp Jackson, Columbia, South Carolina, reporting to the Commanding General, 81st Division, for duty with the 402d Telegraph Battalion: First Lieut. Harold B. Wey, First Lieut. Montgomery B. Hill, First Lieut. Ernest F. Brown, First Lieut. William B. Thompson.

First Lieut. George L. Powell, Signal Corps, orders issued to report to Hazelhurst Field, Mineola, Long Island, New York, are amended to direct him to report at Langley Field, Hampton, Virginia.

Major Delos C. Emmons, Junior Military Aviator, Signal Corps, and First Lieut. Henry W. Horn, Medical Reserve Corps, have been appointed to meet at San Francisco, California, for the purpose of examining applicants in the Aviation Section, S.O.R.C.

Capt. Daniel N. Henry, Av. Sec., S.O.R.C., to Chief Signal Officer of the Army for duty.

First Lieut. J. Caldwell, Rochester, Av. Sec., Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. C. Joseph Dexter, Av. Sec., S.O.R.C., active duty to Signal Corps Aviation School, Essington, Pennsylvania.

First Lieut. William T. Goldsborough, Av. Sec., S.O.R.C., active duty at Camp Kelly, South San Antonio, Texas.

First Lieut. Frederick C. Horner, Signal Corps, to Chief Signal Officer of the Army for assignment.



Carl T. Batts, senior instructor Curtiss Aviation School Newport News who looped-the-loop 126 times consecutively on a Curtiss JN4.

First Lieut. James H. Adeaue, Av. Sec., S.O.R.C., active duty reporting to the Chief Signal Officer of the Army for assignment.

First Lieut. Theodore Arter, Av. Sec., S.O.R.C., to Langley Field, Hampton, Va.

First Lieut. Christopher O. Anderson, Av. Sec., S.O.R.C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

The following named Officers, Av. Sec., S.O.R.C., active duty at Army Balloon School, Fort Omaha, Nebraska, First Lieut. James Arthur Christie, First Lieut. James P. Haight, First Lieut. Harry L. Wheeler, Signal Corps, to Langley Field, Hampton, Virginia.

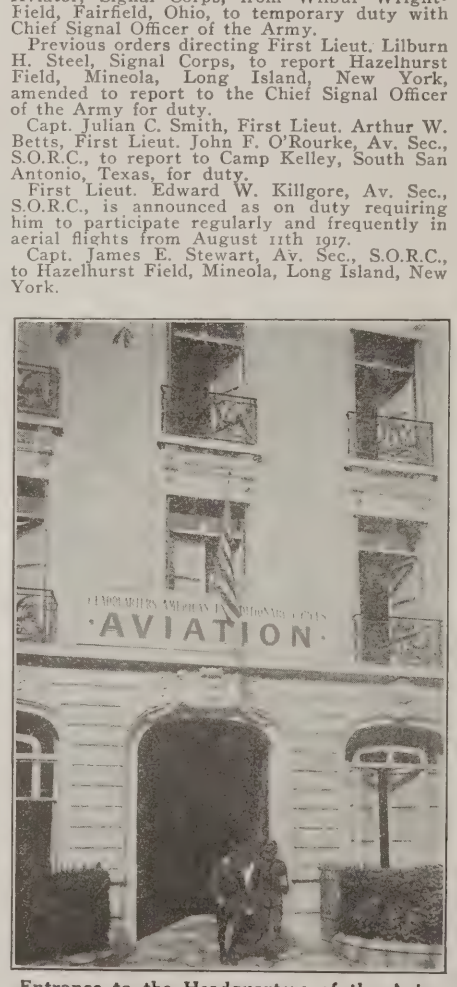
Major Arthur R. Christie, Junior Military Aviator, Signal Corps, from Wilbur Wright Field, Fairfield, Ohio, to temporary duty with Chief Signal Officer of the Army.

Previous orders directing First Lieut. Lilburn H. Steel, Signal Corps, to report Hazelhurst Field, Mineola, Long Island, New York, amended to report to the Chief Signal Officer of the Army for duty.

Capt. Julian C. Smith, First Lieut. Arthur W. Betts, First Lieut. John F. O'Rourke, Av. Sec., S.O.R.C., to report to Camp Kelley, South San Antonio, Texas, for duty.

First Lieut. Edward W. Killgore, Av. Sec., S.O.R.C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from August 11th 1917.

Capt. James E. Stewart, Av. Sec., S.O.R.C., to Hazelhurst Field, Mineola, Long Island, New York.



Entrance to the Headquarters of the Aviation Corps of the American Expeditionary Forces in France. French official photo.
© Kadel & Herbert.

First Lieut. Philip B. Smith, S.O.R.C., from Chanute Field, Rantouel, Illinois, to Langley Field, Hampton, Virginia, for duty.

First Lieut. Enoch M. Brown, S.O.R.C., from Training Camp, Fort Leavenworth, Kans., to Camp Lewis, American Lake, Wash., reporting to Comamnding General 91st Division for duty with the 405th Telegraph Battallion.

Previous orders directing First Lieut. George P. Bush, S.O.R.C., to report Commanding General, 91st, Camp Lewis, American Lake, Washington, for duty with the 405th Telegraph Battallion are revoked.

First Lieut. John F. Beecher, Av. Sec., S.O.R.C., to Signal Corps General Supply Depot, Richmond, Va.

First Lieut. Harrison W. Flickinger, Av. Sec., S.O.R.C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from July 3, 1917.

The following Officers, Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York, for duty: First Lieuts. O. Eugene Adams, Russell S. Dean, George Powell, William W. Shouster, Leonard Work, George Barger, John George, Edward C. Fisher, J. W. Bailey, C. J. Pankow, Richard M. Merkel, George E. Wright, Frederick E. Schilling, Edmund J. Burke, Allen E. Lockwood, Godfrey K. Downer, Jacob E. Everbach, Henry N. Hinckley, Frederick R. Speed, James W. Cullen, Russell Hinman.

Captain George R. Wadsworth, Aviation Section, Signal Officers' Reserve Corps, to Philadelphia, Pa., for duty at the naval aircraft factory, United States Navy Yard.

First Lieutenant Frank M. Murphy, aviation section, Signal Officers' Reserve Corps, to active duty and report to Captain A. B. Lambert, Signal Corps, Missouri Aeronautical Society, St. Louis, Mo.

First Lieutenant Carroll D. Weatherly, aviation section, Signal Officers' Reserve Corps, to active duty at Wilbur Wright Field, Fairfield, Ohio.

First Lieutenant Alexander H. Fraser, Aviation Section, Signal Officers' Reserve Corps, to active duty at Camp Kelly, South San Antonio, Texas.

First Lieutenant Walter H. Gehan, Aviation Section, Signal Officers' Reserve Corps, to Millington, Tenn., on October 27, 1917, for duty.

Captain Ralph S. Rainsford, Aviation Section, Signal Officers' Reserve Corps, to active duty and report to commanding general, Eastern Department, Governor's Island, N. Y.

Captain Percy H. Jennings, Aviation Section, Signal Officers' Reserve Corps, is relieved from duty in the office of the department aeronautical officer, Eastern Department, and will proceed to this city and report to chief signal officer of the army for duty.

First Lieutenant Harley W. Lake, Aviation Section, Signal Officers' Reserve Corps, to Dallas, Texas, and report to the commanding officer, Love Field, for duty not later than October 27, 1917.

The War Department issued the following army orders Oct. 10:

Signal Reserve Corps

Capt. D. M. Henry to Washington, 1st Lieut. E. B. Jones to Mineola, 2d Lieut. P. B. Buzzell, 2d Lieut. B. W. Estabrook and 2d Lieut. N. S. Frothingham will report to Cmdg. Off. Ft. Sill.

1st Lieut. W. Flickinger to participate in flights.

1st Lieut. E. M. Brown to Camp Lewis.

1st Lieut. G. P. Bush, previous orders revoked.

1st Lieut. J. F. Beecher, to Richmond.

1st Lieut. E. W. Killgore, will participate in flights.

Capt. J. E. Stewart to Mineola.

1st Lieut. P. D. Smith to Langley Field.

Capt. J. C. Smith, 1st Lieut. A. W. Betts, 1st Lieut. W. T. Goldsborough, and 1st Lieut. O'Rourke to Camp Kelley.

1st Lt. T. Arter to Langely Field.

1st Lieut. C. O. Anderson to Mineola.

1st Lt. J. Christie and 1st Lieut. J. P. Haight to Ft. Omaha.

1st Lieut. J. H. Adoue to report to Chief Sig. Off.

1st Lieut. W. T. Goldsborough to Camp Kelley.

Signal Corps

Following to Mineola: First Lieutenants—O. E. Adams, G. Powell, L. Work, J. G. George, J. W. Bailey, R. H. Merkel, F. E. Schilling, A. E. Lockwood, J. E. Averbach, F. R. Sheed, R. Hinman, R. S. Dean, W. W. Shuster, G. Barger, E. C. Fisher, C. J. Pankow, G. E. Wright, E. J. Burke, G. K. Downer, H. N. Hinckley, J. W. Cullen, J. C. Rochester.

1st Lieut. G. Powell, previous orders amended to direct Lieut. Powell to report to Langley Field.

1st Lt. H. L. Wheeler to Langley Field.

Major A. R. Christie to Washington and report to Chief Sig. Off.

1st Lieut. L. H. Steel, previous orders amended to direct him to report to the Chief Sig. Off.

1st Lieut. C. J. Dexter to Essington.

1st Lieut. F. C. Horner to report to Chief Sig. Off.

Capt. D. L. Roscoe to participate in flights.

Major G. E. Nelson to Chicago.

The board of officers appointed June 8, 1917, War Dept., at Berkeley, Cal., is dissolved.

A board of officers to consist of: Major D. C. Emmons, Junior Military Aviator, Sig. C., and 1st Lieut. H. W. Horn, M.R.C., is appointed to meet at San Francisco, Cal., for examining applicants for commission in the Av. Sec., Sig. O.R.C.

Nickel Co. Head Quits for Aviation Staff

Ambrose Monell, president of the International Nickel Company, has tendered his resignation to accept a commission as colonel on the staff of the commander of the American aviation forces obroad.

Signal Corps Officers Are Assigned to Active Duty

The following-named officers, Signal Officers' Reserve Corps, are assigned to active duty and will comply with the following orders:

Capts. Frank W. Sherwood and Eugene C. Higgins; First Lieuts. Delbert D. Pittman, Samuel H. Munson, Chester B. Mulkins, John M. Wattles, John O. Sherlock, John H. Roche, John E. Johnson, William L. Mooney, Fred E. Stuard, Clarence Sawyer, William H. Brogan, James C. Pierson, William A. Bertrand, John Warren, Howard Van Winkle, David Maxwell, Mortimer C. Funston, Arthur P. Kellond, John J. Maret, Brethold A. Moeller, John O. Burnette, Raymond H. Allegar, Elmer J. McQuillan, Ernest R. Crum, Frank N. Hurd, Charles B. Warren, William T. Kelly, Charles E. Ward, Jr., Frederick W. Grant, and Elmer F. W. Niemoeller.

Capts. Sherwood and Higgins will proceed to Chicago, Ill., and report to the commanding general, Central Department, for assignment to duty in the office of the department signal officer, Central Department.

Lieut. Pittman will proceed to San Antonio, Tex., and report in person to the commanding general, Southern Department, Fort Sam Houston, for assignment to duty.

Lieuts. Munson, Johnson, Sawyer, Pierson, Maxwell, Burnette, Allegar, McQuillan, Crum, Hurd, Charles B. Warren, Kelly, Grant, Niemoeller, and Bertrand, will proceed to Fort Leavenworth, Kans., and report in person to the commandant, Signal Corps training camp.

Lieut. Roche will proceed to Camp Fremont, Palo Alto, Cal., and report in person to the commanding officer for duty as signal supply officer.

Lieuts. Mooney, Stuard, Brogan, Van Winkle, Ward, Wattles, Sherlock, and John Warren will proceed to Little Silver, N. J., and report in person to the commandant, Camp Alfred Vail.

Lieut. Mulkins will proceed to Little Silver, N. J., and report in person to the commanding officer, 10th Field Battalion, Signal Corps.

Lieut. Funston will proceed to Leon Springs, Tex., and report in person to the commandant, Camp Samuel F. B. Morse.

Lieuts. Kellond, Maret, and Moeller will proceed to Honolulu, Hawaii, and report in person to the commanding general, Hawaiian Department.

War Department, Special Orders 228

Capt. Allen H. Zacharias, Av. Sec. S. O. R. C., assigned to active duty, reporting to the Chief Signal Officer of the Army for duty.

First Lieut. David H. Trevor, 14th Field Artillery, detailed to fill a vacancy in the Signal Corps. Assigned to duty at Fort Leavenworth, Kans., Signal Corps Training Camp.

First Lieut. Paul C. Wanser, Av. Sec. S. O. R. C., assigned to active duty, reporting Selfridge Field, Mount Clemens, Mich., for duty.

First Lieut. John P. Ramsey, Av. Sec. S. O. R. C., active duty, reporting to Langley Field, Hampton, Virginia.

First Lieut. John H. Potter, Av. Sec. S. O. R. C., active duty, at Camp Kelly, South San Antonio, Texas.

First Lieut. George B. Patterson, Av. Sec. S. O. R. C., active duty at Selfridge Field, Mount Clemens, Mich.

First Lieut. Floyd M. Shawalter, Av. Sec. S. O. R. C., active duty, Selfridge Field, Mount Clemens, Mich.

First Lieut. Charles N. Snowdon, Av. Sec. S. O. R. C., active duty, Selfridge Field, Mount Clemens, Mich.

Capt. Nicholas Kramer, Signal Corps, to duty at Camp Kelly, South San Antonio, Texas.

Major Daniel M. Cheston, Jr., Signal Corps, to command of School of Military Aeronautics at Cornell University, Ithaca, N. Y.

Maj. Fred W. Leadbetter, Signal Corps, to report to the Chief Signal Officer of the Army for duty.

First Lieut. Bruce E. Granger, Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York, for duty.

First Lieut. Robert E. Winters, Av. Sec. S. O. R. C., is honorably discharged.

First Lieut. Thomas S. Rosser, S. O. R. C., resignation has been accepted by the President.

Second Lieut. Hal. C. Sanborn, Quartermaster Corps, National Army, report to the commanding officer, Signal Corps Aviation School, Mineola, Long Island, N. Y., for duty.

Capt. Thomas Walkup, Av. Sec. S. O. R. C., is appointed to meet at Memphis, Tenn., for the purpose of examining applicants for commission in the Aviation Section, Signal Officers' Reserve Corps.

First Lieut. James B. Stanford, Medical Reserve Corps, is appointed to meet at Memphis, Tenn., for the purpose of examining applicants for commission in the Aviation Section, Signal Officers' Reserve Corps.



Brigadier-General Chas. McKinley Saltzman, assistant chief of the Aviation Section of the Signal Corps.

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First Lieut. Winthrop H. Battles, Av. Sec. S. O. R. C., to active duty Selfridge Field, Mount Clemens, Mich.

First Lieut. Morris Archer, Av. Sec. S. O. R. C., to active duty attachment, Aviation Section, Signal Corps, 16 Victoria Street, Toronto, Canada.

The resignation by First Lieut. Milton T. Eglin, S. O. R. C., has been accepted by the President.

The following named officers ordered to proceed to Mineola, Long Island, N. Y., for temporary duty and upon completion will return to their proper station: Major John B. Watson, Av. Sec. S. O. R. C.; Major William H. Wilmer, Medical Reserve Corps; Major Edward G. Seibert, Medical Reserve Corps.

Orders directing Major Thurman H. Bane, Junior Military Aviator, Signal Corps, to proceed from San Diego, California, to the School of Aeronautics, Berkeley, California, for temporary duty and thence to Millington, Tenn., are amended to direct Major Bane to proceed from Berkeley via Washington, D. C., for temporary duty in the office of the Chief Signal Officer, and thence to Millington, Tenn., to arrive there not later than Oct. 27th, 1917, to assume command of Park Field.

Col. Stanley D. Embick, Signal Corps, to duty with Chief Signal Officer of the Army.

Capt. Harrison H. C. Richards, and Capt. Fred. Seydel, Av. Sec. Signal Corps, from duty School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass., to Camp Kelly, South San Antonio, Texas.

Capt. Eugene T. Bernart, Av. Sec. S. O. R. C., to New York City, N. Y., for duty at the Army Linen depot reporting by letter to the Chief Signal Officer of the Army.

Majors T. L. Christal and F. L. Martin, Signal Corps, from duty in the Hawaiian Department to Washington, D. C., reported to the Chief Signal Officer for duty.

Capt. Reuben H. Fleet, Quartermaster Corps, Washington National Guard, and Second Lieut. Frederick I. Eglin, Second Infantry, Indiana National Guard, rated junior military aviators from Sept. 12th, 1917, under the provision of Section six of the act of Congress approved July 24th, 1917.

Capt. Morgan H. Grace, Av. Sec. S. O. R. C., detailed member of board of officers appointed in paragraph 33, S. O., number 41, War Department, February 19th, 1917.

First Lieut. S. D. Burchenal, Signal Corps to Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

First Lieut. Harry C. Colburn, Av. Sec. S. O. R. C., to duty Hazelhurst Field, Mineola, Long Island, New York, for duty.

Major George B. Hunter, Signal Corps, from duty office Chief Signal Officer to command of School of Military Aeronautics, University of California, Berkeley, California.

By direction of the President, Capt. Wilbur S. Owensby, S. O. R. C., is honorably discharged from the service of the United States, his services being no longer required.

Lieut. Col. Oliver D. Filley, Signal Corps, to Washington, D. C., reporting to Chief Signal Officer for duty.

The following named officers of the Aviation Section, S. O. R. C., are announced as on duty requiring them to participate regularly and frequently in aerial flights dating as follows: First Lieut. Shiras A. Blair, August 20th, 1917; First Lieut. William A. Boggs, August 20th, 1917; First Lieut. Thomas J. D. Fuller, August 17th, 1917; First Lieut. Alfred J. Kalph, August 29th, 1917; First Lieut. James F. Carr, August 29th, 1917; First Lieut. Eckley B. Markel, Sept. 14th, 1917; First Lieut. Frank S. Patterson, Sept. 15th, 1917.



Gordon Prince of Boston, another member of the Prince family to join the air service.

By Hungerford.

Special Order Number 230.

A board of officers to consist of Capt. J. S. Reeves, Av. Sec., S. O. R. C., and Capt. Edward deW Wales, Medical Reserve Corps, is appointed to meet at Indianapolis, Ind., for the purpose of examining applicants for commission Aviation Section, S.O.R.C.

Capt. Henry Rottschaefer, Signal Corps, to Chief Signal Officer of the Army for duty.

Major Roy C. Kirkland, Signal Corps, junior military aviator, dating from Aug. 6th, 1917.

First Lieut. Nelson Fell, Signal Corps, to Chief Signal Officer of the Army for duty.

Major Douglas B. Netherwood, junior military aviator, Signal Corps, to command of Signal Corps Aviation School, Love Field, Dallas, Texas.

Under provisions of paragraph 13, act approved June 3, 1916, Lieut. Col. Joseph C. Morrow and Major Douglas Netherwood, junior military aviators, Signal Corps, are rated military aviators, dating from July 23rd, 1917, and August 20th, 1917, respectively.

Capt. J. Stanley Foster, Av. Sec. S. O. R. C., active duty at Rich Field, Waco, Texas.

First Lieut. Lonnie H. Lee, Av. Sec. S. O. R. C., active duty at Call Field, Wichita Falls, Texas.

First Lieut. Edward E. Dean, Signal Corps, to Chief Signal Officer of the Army for duty.

Capt. Dexter C. Rumsey, Cavalry, detached Officers' list, September 14th, 1917; Capt. Hugh J. Knerr, Field Company A, Hawaiian Signal Corps, September 14th, 1917; Capt. Roy L. Noggle, Field Company A, Hawaiian Signal Corps, September 14th, 1917, are announced as on duty to participate regularly and frequently in aerial flights from dates set after their respective names.

Paragraph 85, special orders, number 223, September 25th, 1917, is amended to rate Major Henry B. Hersey, Av. Sec. S. O. R. C., as a junior military aeronaut instead of a junior military aviator.

First Lieut. James C. Lewis, S. O. R. C., to duty at Signal Corps Training Camp, Fort Leavenworth, Kansas.

First Lieuts. Edward Buford, Jr., and John A. King, Av. Sec. S. O. R. C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

Capt. A. L. Loening, Av. Sec. S. O. R. C., from duty Office of Chief Officer of the Army to Hazelhurst Field, Mineola, Long Island, New York, for temporary duty, upon completion preceeding to Love Field, Dallas, Texas.

First Lieut. W. A. Fleming Jones, Av. Sec. S. O. R. C., active duty at School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

(*Continued on page 258*)

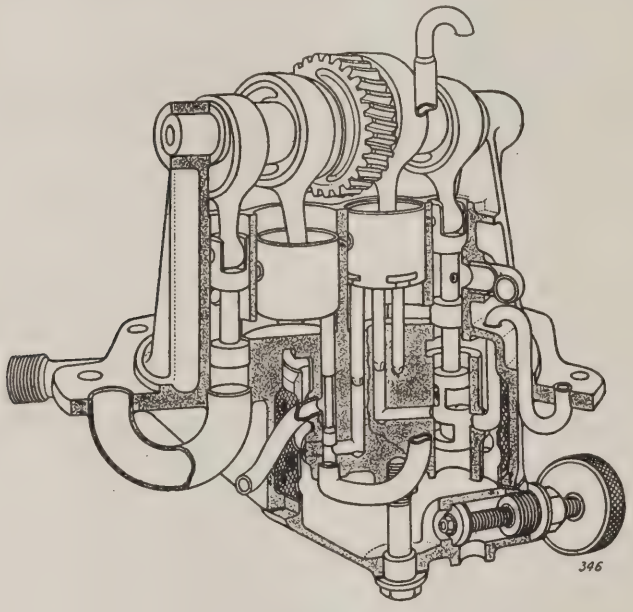
THE 260 H.P. MERCEDES

THE British Naval and Military authorities have favored our contemporary, *The Automobile Engineer,* with the figures that they have prepared on the figures and data of the 260 H.P. Mercédès engine, which are described in our issues of Sept. 17 and Oct. 1, and, in conjunction with the description, these will be of considerable interest to aircraft engine designers. A further perspective general arrangement sketch of the oil pump has come to hand, and this illustration will doubtless also be of interest in connection with the notes that appeared in our previous issues.

When certain minor repairs had been effected power readings were taken from the engine at full throttle from 950 r.p.m. to 1,600 r.p.m., and simultaneously fuel consumption readings were taken.

During the test the water outlet temperature varied from 75° C. to 81° C. A water brake was used, and this was set to absorb full power at 1,400 r.p.m. The engine was gradually throttled down to 900 r.p.m., power and consumption readings being taken. The test results were plotted, and these will be found in fig. 1.

At the conclusion of the readings a run of one hour's duration at 1,400 r.p.m. and at full throttle was made with the following results:



Perspective general arrangement of the Mercédès oil pump.

Average b.h.p.	.252
Petrol, pints per hour	152.5
" " h.p. "	0.605
Oil, " per "	8.125
" " h.p. "	0.032
Oil temperature at end of run	54.5°C.
Water outlet temperature	80°C.

It was noticed that at speeds below 1,150 r.p.m. the vibration was rather excessive. No adjustments were made to the engine during the tests.

The following other details and data were taken:

Bore	160 mm.	6.30 in.
Stroke	180 mm.	7.09 in.
Stroke/bore ratio	1.125 — 1	
Stroke volume of one cylinder	3620 cu. cm.	220.82 cu. in.
Total stroke volume of engine	21720 cu. cm.	1324.92 cu. in.
Area of one piston	201.062 sq.cm.	31.164 sq.in.
Total piston area of engine	1206.372 sq.cm.	186.984 sq.in.
Clearance volume of one cylinder	920 cu. cm.	56.12 cu. in.
Compression ratio	4.94 — 1	
Normal b.h.p. and speed	252 at 1400	
Piston speed	1655 ft. per min. at 1400	
	1772 ft. per min. at 1500	
Brake mean effective pressure	107.5 lb. per sq. in.	
Cu. in. of stroke volume per b.h.p.	5.25	
Sq. in. of piston area per b.h.p.	.74	
H.P. per cu. ft. of stroke volume	329.14 h.p.	
H.P. per squ. ft. of piston area	194.6	
Direction of rotation of crank	Anti-clock.	
Direction of rotation of propeller	Anti-clock.	
Normal speed of propeller	Engine speed.	
Oil consumption per hour	8.125 pints (9.14 lb.).	
Oil consumption per b.h.p.	0.0325 pint (0.0366 lb.).	
Specific gravity of oil	0.900	
Type of carburetor	One twin jet Mercédès.	

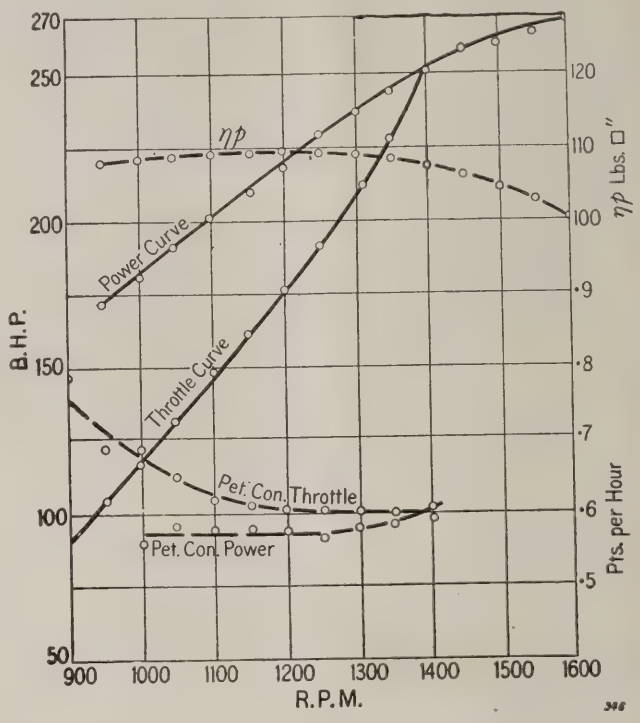


Fig. 1.

260 h.p. Mercédès aircraft engine.

Mixture control	Automatic.
Fuel consumption per hour	152 pints (136.8 lb.).
Fuel consumption per b.h.p. hour	0.604 pint (0.543 lb.).
Specific gravity of fuel	0.720
Type of magneto	Two ZH6
Firing sequence of engine	Prop. 1, 5, 3, 6, 2, 4
Numbering of cylinders	Prop. 1, 2, 3, 4, 5, 6
Direction of rotation of magneto, facing driving end of armature	Anti-clock.
Magneto timing	31° early
Inlet valve opens, deg. on crank	1° late
Inlet valve closes, deg. on crank	49.3° late
Period of induction	228°
Maximum lift of inlet valve	10.125 mm.
Diameter inlet valve port	55.25 mm.
Area through inlet valves (total)	35.12 sq. cm. 5.44 sq. in.
Mean gas velocity through inlet valve	158 ft. per sec.
Clearance of inlet tappet	.018 in.
Exhaust valve opens, deg. on crank	50.6° early.
Exhaust valve closes, deg. on crank	17.6° early.
Period of exhaust	247°
Maximum lift of exhaust valve	10 mm.
Diameter exhaust valve port	55.25 mm.
Area through exhaust valves (total)	34.70 sq. cm. 5.4 sq. in.
Clearance of exhaust tappet	.018 in.
Speed of revolution counter drive	Camshaft speed.
Outside diameter of valve spring	1.250 to 1.352 in.
Diameter of wire	1.56 in.
Number of free coils	7
Length of spring	3 in.
Half compression cam opens exhaust cam	12° A.B.C.
Half compression cam closes exhaust cam	44° B.T.C.
Diameter of induction pipe branch	75 mm.

Diameter of induction pipe main.	100 mm.
Diameter of choke tube	32 mm.
Length of connecting rod between centres	326 mm.
Diameter of crank pin	64 mm.
Length of crank pin bearing	80 mm.
Diameter of journals	64 mm.
Length of journal bearings.....	64 mm.
Length of front journal bearings.	104 mm.
Connecting rod side clearance (total) in piston.....	2.25 mm.
Total capacity of each petrol tank	95 galls.
Total capacity of each oil tank...	7.25 galls.
Total capacity of water in system	6.5 galls.
Diameter of piston at top	159.258 mm.
Diameter of piston at bottom....	159.715 mm.
Width of rings	5 mm.
Width of gap in rings in cylinder.	16/1000 in.
Diameter of water pump inlet....	44 mm.
Diameter of water pump outlet...	44 mm.
Weight of engine complete, without water, fuel, or oil.....	936 lb.
Weight per b.h.p., ditto.....	3.71
Weight of exhaust manifold.....	26 lb.
Weight of fuel per hour.....	136.8 lb.
Weight of oil per hour.....	9.14
Total weight of fuel and oil per hour	145.94
*Gross weight of engine in running order, less fuel and oil....	1098 lb.
Weight per b.h.p., ditto.....	4.36

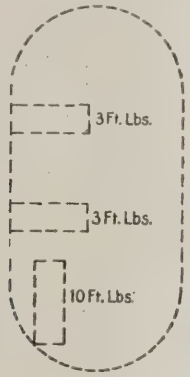


Fig. 2.

†Gross weight of engine in running order, with fuel and oil for six hours	2061 lb.
Weight per b.h.p., ditto.....	8.18 lb.
Weight of complete cylinder, with valves and springs.....	34.25 lb.
Weight of complete piston, with rings and gudgeon pin.....	10.725 lb.
Total weight of complete connecting rod, with gudgeon pin bush.	7 lb.
Weight of connecting rod big-end, complete	4 lb. 14 oz.
Weight of connecting rod small-end, with bush	2 lb. 2 oz.
Weight of complete valve, with spring washer and nut (inlet and exhaust)	.759 lb.
Weight of valve rocker, complete	1.246 lb.
Weight of crankshaft, with prop. boss	139.5 lb.

* Allowance for tanks at rate of 10% of weight of fuel and oil.
† Allowance for cooling system at rate of 0.65 lb. per b.h.p.

Analysis of Materials

Analysis shows the chemical composition of the various parts to be as follows:

Timing Gear Wheel.	
Carbon	0.30%
Silicon	0.27%
Manganese	0.74%
Sulphur	0.025%
Phosphorus	0.030%
Nickel	4.17%
Chromium	1.39%
Vanadium	Nil.

Connecting Rod.	
Carbon	0.13%
Silicon	0.19%
Manganese	0.52%
Sulphur	0.033%
Phosphorus	0.014%
Nickel	2.83%.
Chromium	0.29%

Camshaft.	
Carbon	0.16%
Silicon	0.27%
Manganese	0.60%
Sulphur	0.052%
Phosphorus	0.014%

Camshaft Housing.	Body.	Cover.
Carbon	0.24%	—
Graphitic Carbon	—	2.97%
Combined Carbon	—	0.62%
Silicon	0.02%	1.81%
Manganese ...	0.46%	0.53%
Sulphur	0.041%	0.118%
Phosphorus ..	0.012%	0.085%

Valves.	Exhaust.	Inlet.
Carbon	1.75%	1.82%
Silicon	0.58%	0.52%
Manganese ...	0.10%	0.10%
Sulphur	0.048%	0.048%
Phosphorus ..	0.013%	0.010%
Nickel	Nil.	Nil.
Chromium ...	10.85%	10.47%
Vanadium and Tungsten ..	Nil.	Nil.

Crank Case.	
Total Silicon	0.96%
Graphitic Silicon	0.35%
Copper	4.22%
Zinc	3.65%
Iron	0.81%

Valve Spring.	
Carbon	0.52%
Silicon	0.07%
Manganese	0.59%
Sulphur	0.060%
Phosphorus	0.031%
Nickel and Chromium	Nil.

Crankshaft.	
Carbon	0.41%
Silicon	0.29%
Sulphur	0.052%
Phosphorus	0.042%
Manganese	0.64%
Nickel	2.36%
Chromium	0.86%

Mechanical tests gave the following results:

Valve Spring.

Compression in inch	Load in lb.	Unloading
0	0	0
.1	6	4¾
.2	12	10¾
.3	18	16¾
.4	24	23
.5	30	29⅛
.6	36	35⅛
.7	42	41
.8	48	47
.9	54⅜	53⅛
1.0	60⅜	59⅝
1.1	66¾	65⅞
1.2	73½	72½
1.3	81	79¾
1.4	88½	88
	Closed.	
1.5	97⅛	

Permanent set—Nil.

Crank Case.—Tensile Test.

Yield point 8.7 tons per sq.in.
Max. stress 9.35 tons per sq.in.
Elongation 3.55% on 2 in.
Reduction of area.. 3.5%
Specific Gravity. 2.867

Crankshaft.—Tensile Test.

Yield point 55.7 tons per sq.in.
Max. stress 62.0 tons per sq.in.
Elongation 13.5% on 2 in.
Reduction of area..23.5%

Impact Test on Crankshaft

23 ft. lb. } On boss in direction of shaft.
16 ft. lb. }
10 ft. lb. } At positions indicated in fig. 2.
3 ft. lb. }
3 ft. lb. }

Aerial Patrol Unit Will Not Disband

Denial of the report printed last week that Aerial Coast Patrol Unit No. 3 had been disbanded has been made by members of the organization. Eugene Untermeyer, one of these members, said that the work of the unit would continue as heretofore, and that they now had at their training grounds, at Mastic, L. I., more flying boats than ever. Mr. Untermeyer issued this statement

"Reports to the effect that Coast Patrol Unit No. 3, stationed at Mastic, L. I., is disbanded are without foundation. C. D. Backus and others who were instrumental in the formation of the unit have been called into the government service, but about fifteen men remain in training at Mastic, under the supervision of W. Leonard Bonney. It is their intention to continue their training until all of them are called into the service, unless, in the meantime, we find that flying is made impossible by weather conditions."

Silverite, A New Metal

A new development in the alloying of aluminum with other metals has just been accomplished by the production of "Silverite." This metal is something entirely new and is composed of a mixture of aluminum and copper, zinc and steel in varying proportions according to the requirements. The introduction or alloying of steel with aluminum is somewhat startling and at first thought seems to be impossible, yet the makers of "Silverite" have succeeded in doing just this thing, and the resulting metal has a specific gravity of 3.1, a tensile strength of from 40,000 to 45,000 pounds per square inch and a compression resistance of 100,000 pounds.

The greater tensile strength of "Silverite" is due not only to the constituents of the alloy, but also to the fact that it is cast in molds made of a composition material, which has the advantage of withdrawing the heat rapidly from the metal, thereby reducing the crystallization to a minimum and making a sound and solid casting of close, even grain.

Peerless to Make Aero Parts

Cleveland.—The Peerless Motor Car Co. is reported to be earning at the rate of $200,000 monthly and has increased its production capacity 50 per cent. It is reported that the Peerless company will soon commence the manufacture of aeroplane parts.

Aeroplane Plant for Sacramento

Sacramento, Cal.—An aeroplane factory will be located in this city at the Globe Iron Works. In a despatch in The Automobile, it is stated that J. M. Henderson, Jr., and associates have been granted a contract for $18,000,000 worth of planes to be furnished within the next twelve months and thirty of the machines are to be delivered before November 1. It is expected that 2,000 workers will be employed with a monthly payroll of $160,000. The contract calls for the delivery of five planes per day.

FOR THE MEN WHO ARE TO GO OVERSEAS—II.

HAVING received a number of requests from aviation instructors and students for French aeronautic literature and realizing that the students who will soon go to France should be familiar with the French aeronautic terms as popularly employed in descriptive literature—instead of merely giving a dictionary of terms; and realizing also the necessity of familiarizing them with the general features of the German machines which they will have to fight, AERIAL AGE sent to France for the very latest technical aeronautic literature and description of German machines.

The second instalment, given herewith, is part of a chapter of the work "L'Aviation Et La Guerre," edited for the Aero Club of France by Jean Lagorgette, the noted French aeronautic engineer.

Officer instructors have suggested that the best plan would be to print the French text without attempting to give the English translation of every word, as the first need is to supply the instructors with the necessary material, to enable them to read from the French and explain to the students while they take notes, which is the present practice in teaching all the other subjects.

In following this advice we are adding the translation of the most common terms and metric table to enable the instructors and students alike to quickly convert metric measurements into the English measurements and vice versa.

ENGLISH-FRENCH GLOSSARY OF TECHNICAL TERMS

Gas bag	Enveloppe
Geared driven } Geared to }	Mutiplié à
Girder	Poutre
Glider	Planeur
Gondola	Nacelle
Helices	Helices
Helicopter	Helicoptère
Horizontal plane (in a)	Plan horizontal
Horse power	Puissance en chevaux
Hydrogen	Hydrogène
Ignition	Allumage
Inch	25.39 m|m
Inclination	Inclination
Keel	Carène
K.P.M. (kilometres per hour)	Kilometres par heure
Kite	Cerf volant
Length	Longueur
Lining Metal	Métal pour garnir les coussinets ou régule
Lower (planes)	Inferieur (plans)
Magneto	Magneto
Maximum	Maximum
Middle (plane)	(Plan) au milleu
Mile	Mile
Military	Militaire
Miscellaneous	General
Monoplane	Monoplan
Motor	Moteur
M.P.H. (miles per hour)	Vitesse
Multiplane	Multiplan
Nacelle	Nacelle
Non-rigid	Souple ou non-rigide
Petrol (gasoline)	Essence
Pilot (driver)	Aviateur or Pilote
Pivot	Pivot
Planes	Plans
Plug	Bougie
Pound (lb.)	O. 453 kg.
Pressure	Pression
Propeller	Helice or Propulseur
Quadruplane	Quadrulan
Quintuplane	Quintuplan
Radiator	Radiateur or Raffroidisseur
Rear (in)	En arrière
Reduction gearing	Engrenage de demultiplication
R.P.M. (revolutions per minute)	Tours
Rigid	Rigide
Rises	S'élève
Rubber	Caoutchouc
Rudder	Gouvernail
Section	Section
Semi-rigid	Demi-rigide
Span	Envergure
Speed	Vitesse
Stability	Stabilite
Stabilising flaps	Ailerons
Steel	Acier
Steering Gear	Direction
Steering Wheel	Volant
Supporting surface	Surface
Surfaces	Surfaces
Suspension	Suspension
Switch	Interrupteur
Tail	Queue
Total weight	Poids total
Transmission Shaft	Arbre de transmission
Trial	Essai
Triplane	Triplan
Universal Joint	Joint universel ou Cardan
Unladen	a vide
Upper (planes)	Superieur (plans)
Useful lift	Poids utile
Valve	Soupape
Vertical plane (in the)	Plan vertical
Vertical rudder	Gouvernail de direction
Volume	Volume
Water-cooled	Refroidissement par eau
Weight	Poids
Wheels	Roues
Wings	Ailes
Wood	Bois
Yard (measure)	0.914 metres

THE METRIC SYSTEM

AS the members of the American Air Service who go to France will need to know the metric system, we are giving herewith the metric tables with explanatory matter.

The editors of the *Scale Journal* are generally considered to be well informed regarding weights and measures. Their editorial in the September issue is a forceful argument for the general use within a reasonable time of the international metric weights and measures.

The first paragraph reads as follows:

"As the great war progresses it becomes more and more apparent each day that the compulsory adoption of the metric system in all civilized countries lies just over the horizon of the near future. Especially is this true in England, where the continued bonds between the great empire and its allies, France, Belgium, Italy, Portugal, Roumania and Serbia, have quite naturally builded a greater understanding of the system, thereby lending a strong impetus to the movement which has long been under way."

Officers of the United States Army and Navy are in the best position to decide on the sizes for their supplies. Their judgment can, should and will be dependent upon. If it be true that the maps of Europe are in meters and that supplies for our allies are far more useful when furnished according to the metric weights and measures to which they are accustomed, these matters should receive consideration. The official announcement is made that our battalions now consist of 1,000 men, corresponding with the units of nearly all of our allies, and that the men are practising with and taking readily to the famous 75 millimeter guns. The war news even reaches America in meters, liters and grams, but up to this time most of the newspapers have taken the trouble to change these units into yards, quarts, etc. For better understanding and more intelligent and effective co-operation with our allies let us consider these international metric weights and measures, which were made legal for all transactions in the United States by Congress on July 28, 1866. Thirty-four nations have for good and sufficient reasons discarded other means of weighing and measuring and made these international weights and measures the only legal standards in their respective countries. The standards for the world, England excepted, are metric, and these are kept for the use of all nations by the International Bureau of Weights and Measures.

United States currency has been taken from the metric system, and the same prefixes are used with like meaning for the dollar, meter, liter and gram. The metric weights and measures found most convenient in other countries and the only ones needed for general use are given with their abbreviations in the following table:

CURRENCY

1,000 mills or 100 cents = 1 dollar.

LENGTH

1,000 millimeters (mm) or 100 centimeters (cm) = 1 meter (m).
1,000 m = 1 kilometer (km).

CAPACITY

1,000 milliliters (mil) or cubic centimeters (cc) =1 liter (l).
1,000 l = 1 kiloliter (kl) or cubic meter (cm m).

WEIGHT

1,000 milligrams (mg) = 1 gram (g).
1,000 g = 1 kilogram (kg). 1,000 kg = 1 metric ton.

A dollar is divided into 100 cents or 1,000 mills, just as the meter is divided into 100 centimeters or 1,000 millimeters. And as, for example, 2 dollars and 25 cents is written $2.25, so 2 meters and 25 centimeters is conveniently written 2.25m. Meters, liters and grams are treated in the same way as dollars. For practical purposes, from units of length are formed the squares, cubic or capacity measures (a cubic measure 10 cm. on each edge, or 1,000 cc., makes 1 liter, and the weights (1 cc. of water weighs 1 gram).

Experience in nearly all nations has demonstrated the great superiority of the metric system. Even in the United States and England it is universally used in chemistry and other fields, and each year its use is more extended and its value more generally appreciated.

Within the United States national organizations, companies and people in many lines of business use the metric weights and measures and heartily advocate their general use. Yet those in our schools, on the street, in the shop and in the home have even stronger reasons for hastening the general use of this simple, universal language of quantity.

The transition from the old units to the meter, liter and gram usually calls for the same quantities only expressed in metric terms. The exact equivalents are here given, but such fractions are rarely needed even in making the change, and where the metric weights and measures are used all fractions may usually be avoided.

LENGTH

For all practical purposes 3 feet and 3⅜ inches equal 1 meter or 100 centimeters, and 1 inch equals 2.5 cm. The exact legal equivalent for the United States is 39.37 inches to 1m.

CAPACITY

One liter equals 1.0567104 liquid quarts or about .91 dry quart. One fluid ounce equals about 29.57 milliliters or cc.

WEIGHT

In avoirpudois weight one ounce equals nearly 28.35 grams; one pound, exactly 453.5924277 g. nearly 454 g. or 454 kg.

One short ton equals about .91 metric ton; one long ton equals about 1.02 metric tons, and one kg. equals about 2.20 pounds.

The sooner we can do away with such odd figures as the above and come to the general and universal use of the simple metric weights and measures the better it will be for our country and the world.

THE METRIC SYSTEM

The fundamental unit of the metric system is the **METER** (the unit of length). From this the units of mass **(GRAM)** and capacity **(LITER)** are derived. All other units are the decimal subdivisions or multiples of these. These three units are simply related, so that for all practical purposes the volume of one kilogram of water (one liter) is equal to one cubic decimeter.

PREFIXES	MEANING			UNITS
MILLI-	= one thousandth	$^1/_{1000}$	.001	
CENTI-	= one hundredth	$^1/_{100}$	.01	**METER** for length
DECI-	= one tenth	$^1/_{10}$	.1	
unit	= one		1.	**GRAM** for mass
DEKA-	= ten	$^{10}/_1$	10.	
HECTO-	= one hundred	$^{100}/_1$	100.	**LITER** for capacity
KILO-	= one thousand	$^{1000}/_1$	1000.	

The metric terms are formed by combining the words **"METER," "GRAM,"** and **"LITER"** with the six numerical prefixes.

LENGTH

10 milli-meters	mm	=	1 centi-meter	cm
10 centi-meters		=	1 deci-meter	dm
10 deci-meters		=	**1 METER** (about 40 inches)	**m**
10 meters		=	1 deka-meter	dkm
10 deka-meters		=	1 hecto-meter	hm
10 hecto-meters		=	1 kilo-meter (about ⅝ mile)	km

MASS

10 milli-grams	mg	=	1 centi-gram	cg
10 centi-grams		=	1 deci-gram	dg
10 deci-grams		=	**1 GRAM** (about 15 grains)	**g**
10 grams		=	1 deka-gram	dkg
10 deka-grams		=	1 hecto-gram	hg
10 hecto-grams		=	1 kilo-gram (about 2 pounds)	kg

CAPACITY

10 milli-liters	ml	=	1 centi-liter	cl
10 centi-liters		=	1 deci-liter	dl
10 deci-liters		=	**1 LITER** (about 1 quart)	**l**
10 liters		=	1 deka-liter	dkl
10 deka-liters		=	1 hecto-liter (about a barrel)	hl
10 hecto-liters		=	1 kilo-liter	kl

The square and cubic units are the squares and cubes of the linear units.

The ordinary unit of land area is the HECTARE (about 2½ acres).

EQUIVALENTS

1 METER = 39.37 INCHES

Legal Equivalent Adopted by Act of Congress, July 28, 1866.

LENGTH

Centimeter	=	0.3937	inch
Meter	=	3.28	feet
Meter	=	1.094	yards
Kilometer	=	0.621	statute mile
Kilometer	=	0.5396	nautical mile
Inch	=	2.540	centimeters
Foot	=	0.305	meter
Yard	=	0.914	meter
Statute mile	=	1.61	kilometers
Nautical mile	=	1.853	kilometers

AREA

Sq. centimeter	=	0.155	sq. inch
Sq. meter	=	10.76	sq. feet
Sq. meter	=	1.196	sq. yards
Hectare	=	2.47	acres
Sq. kilometer	=	0.386	sq. mile
Sq. inch	=	6.45	sq. centimeters
Sq. foot	=	0.0929	sq. meter
Sq. yard	=	0.836	sq. meters
Acre	=	0.405	hectare
Sq. mile	=	2.59	sq. kilometers

VOLUME

Cu. centimeter	=	0.0610	cu. inch
Cu. meter	=	35.3	cu. feet
Cu. meter	=	1.308	cu. yards
Cu. inch	=	16.39	cu. centimeters
Cu. foot	=	0.0283	cu. meter
Cu. yard	=	0.765	cu. meter

CAPACITY

Milliliter	=	0.0338	U. S. liq. ounce
Milliliter	=	0.2705	U. S. apoth. dram
Liter	=	1.057	U. S. liq. quarts
Liter	=	0.2642	U. S. liq. gallon
Liter	=	0.908	U. S. dry quart
Dekaliter	=	1.135	U. S. pecks
Hectoliter	=	2.838	U. S. bushels
U. S. lik. ounce	=	29.57	milliliters
U. S. apoth. dram	=	3.70	milliliters
U. S. liq. quart	=	0.946	liter
U. S. dry quart	=	1.101	liters
U. S. liq. gallon	=	3.785	liters
U. S. peck	=	0.881	dekaliter
U. S. bushel	=	0.3524	hectoliter

WEIGHT

Gram	=	15.43	grains
Gram	=	0.772	U. S. apoth. scruple
Gram	=	0.2572	U. S. apoth. dram
Gram	=	0.0353	avoir. ounce
Gram	=	0.03215	troy ounce
Kilogram	=	2.205	avoir. pounds
Kilogram	=	2.679	troy pounds
Metric ton	=	0.984	gross or long ton
Metric ton	=	1.102	short or net tons
Grain	=	0.0648	grams
U. S. apoth. scruple	=	1.296	grams
U. S. apoth. dram	=	3.89	grams
Avoir. ounce	=	28.35	grams
Troy ounce	=	31.10	grams
Avoir. pound	=	0.4536	kilogram
Troy pound	=	0.373	kilogram
Gross or long ton	=	1.016	metric tons
Short or net ton	=	0.907	metric ton

LENGTHS

INCHES		MILLI-METERS	INCHES		CENTI-METERS	FEET		METERS	U.S.Yards		METERS	U.S.Miles		KILO-METERS
0.03937	=	1	0.3937	=	1	1	=	0.304801	1	=	0.914402	0.62137	=	1
0.07874	=	2	0.7874	=	2	2	=	0.609601	1.093611	=	1	1	=	1.60935
0.11811	=	3	1	=	2.54001	3	=	0.914402	2	=	1.828804	1.24274	=	2
0.15748	=	4	1.1811	=	3	3.28083	=	1	2.187222	=	2	1.86411	=	3
0.19685	=	5	1.5748	=	4	4	=	1.219202	3	=	2.743205	2	=	3.21869
0.23622	=	6	1.9685	=	5	5	=	1.524003	3.280833	=	3	2.48548	=	4
0.27559	=	7	2	=	5.08001	6	=	1.828804	4	=	3.657607	3	=	4.82804
0.31496	=	8	2.3622	=	6	6.56167	=	2	4.374444	=	4	3.10685	=	5
0.35433	=	9	2.7559	=	7	7	=	2.133604	5	=	4.572009	3.72822	=	6
1	=	25.4001	3	=	7.62002	8	=	2.438405	5.468056	=	5	4	=	6.43739
2	=	50.8001	3.1496	=	8	9	=	2.743205	6	=	5.486411	4.34959	=	7
3	=	76.2002	3.5433	=	9	9.84250	=	3	6.561667	=	6	4.97096	=	8
4	=	101.6002	4	=	10.16002	13.12333	=	4	7	=	6.400813	5	=	8.04674
5	=	127.0003	5	=	12.70003	16.40417	=	5	7.655278	=	7	5.59233	=	9
6	=	152.4003	6	=	15.24003	19.68500	=	6	8	=	7.315215	6	=	9.65608
7	=	177.8004	7	=	17.78004	22.96583	=	7	8.748889	=	8	7	=	11.26543
8	=	203.2004	8	=	20.32004	26.24667	=	8	9	=	8.229616	8	=	12.87478
9	=	228.6005	9	=	22.86005	29.52750	=	9	9.842500	=	9	9	=	14.48412

Notes, Relatives aux Avions Allemands (Second Instalment)

Per JEAN LAGORGETTE

Guidon: réticule composé de 2 fils en croix dans un anneau.

Les accessoires et appareils de bord sont, comme sur la plupart des avions allemands : une magnéto de départ, un compte-tours Phyllax Morell, un manomètre (Benz, sur le n° 910, pourtant pourvu d'un moteur Mercédès), une boussole (plus volumineuse que les boussoles anglaises, et posée ici à l'intérieur du fuselage, et non au-dessus des ailes inférieures comme sur le Roland biplace, ou sous les ailes supérieures, comme à tous les autres biplaces), un anémomètre Morell à « cuillers », fixé à l'un des mâts. Benzin-Uhr, ou niveau d'essence à cadran. Maximal. Souvent la boussole est de la marque C. Plath (au lieu de C. Bamberg).

2° Albatros D. III (D. I nouveau)

Les Albatros de chasse que nous qualifions D. III, parce qu'ils continuent l'évolution des D. I. aux D. II, conservent un aspect similaire et ont la plupart des parties identiques aux leurs. Ils semblent représenter le dernier mot du programme élaboré fin 1916 et actuellement en cours d'exécution.

Il vient pourtant déjà d'en être abattu un certain nombre : D. 1982/16, D. 1990, D. 2107, D. 2111 (1505H-2588), capturé fin avril, etc..., et d'autres dont manque le numéro, — la plupart réceptionnés dans les derniers jours de février 1917.

Gouvernes, fuselage, T. A., moteur et armement (2 mitrailleuses fixes de Spandau), restent analogues à ceux des types D. I et II. Le contre-plaqué du fuselage est verni ou ripoliné en jaune clair, tandis que les ailes et gouvernes restent vertes et marron foncés.

Les différences, qui résident donc uniquement dans les ailes, sont toutes inspirées des Nieuports, dont cet appareil est une caricature, et donnent à craindre des confusions. Il est donc d'autant plus nécessaire d'étudier attentivement ce type, d'ailleurs important par lui-même.

Comme au Nieuport, les ailes supérieures n'ont pas de V et sont beaucoup plus profondes que les inférieures, et les inférieures sont en V, paraissant beaucoup plus minces, et ont une envergure presque égale à celle des ailes supérieures; les ailes sont décalées et ont une seule paire de mâts en V, de chaque côté.

Mais, à la différence du Nieuport, ce sont ici les appareils allemands qui ne sont pas en flèche et qui ont les bords externes très obliques, donnant ainsi aux ailes vues de dessous ou de dessus, un contour nettement trapézoïdal avec angles arrondis et ailerons sensiblement débordants et gauchis. Surtout, les gouvernes sont différentes: à vaste contour de pelle, sans échancrure, pour la profondeur; hautes, allongées, à arête arrondie, et entièrement en retrait au-dessus du fuselage, pour la direction.

La cabane est très évasée. Enfin, l'aspect du fuselage (sans compter sa couleur et celle des ailes), diffère, avec sa forme monocoque, son avant en pointe avec calotte, mais surmonté de l'énorme moteur en saillie (dont le son est différent des rotatifs).

Envergure des ailes supérieures: 9 m. 03, à la pointe des ailerons; 8 m. 63, au longeron postérieur; 7 m. 55, au longeron antérieur)

Envergure des ailes inférieures: 8 m. 75 (2 fois 3 m. 94 + intervalle de 0 m. 865).

Profondeur des ailes supérieures: 1 m. 50; croissant sur la longueur de l'aileron jusqu'à 1 m. 75, car la profondeur de l'aileron passe de 0 m. 30 à leur naissance jusqu'à 0 m. 55.

L'écartement, de 1 m. 50 entre bords d'attaque à l'aplomb des flancs du fuselage, décroît jusqu'aux extrémités en raison du V

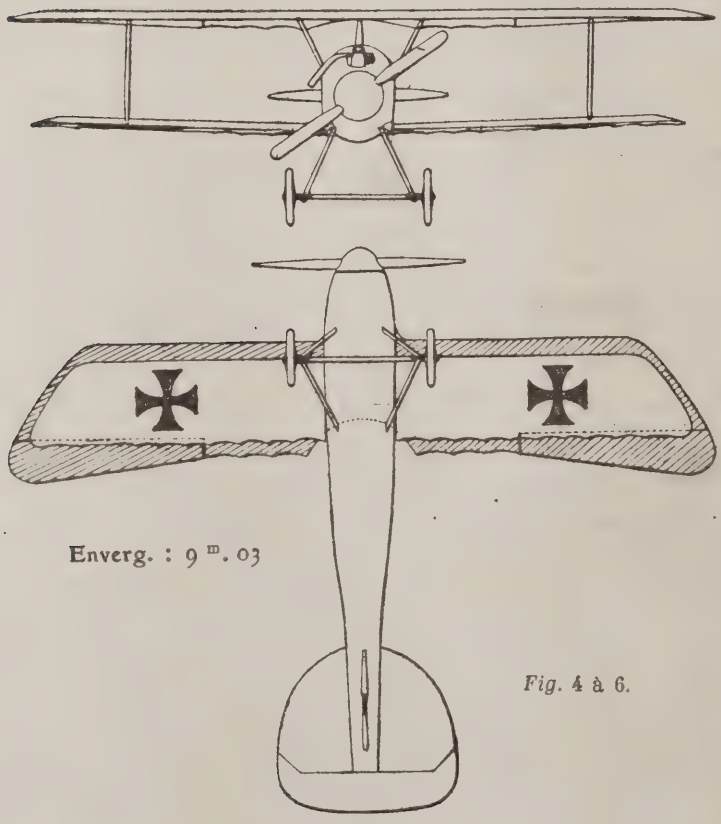




Fig. 4 à 6.

ALBATROS D III

AILES. — Envergure inférieure *presque égale* à la supérieure ; une seule paire de mâts en V, de chaque côté ; **ailes inférieures moins profondes, paraissant plus minces que les supérieures, et seules en V** ; ailes non en flèche, *très trapézoïdales*, avec ailerons débordant en biais ; leurs milieux sont au même aplomb.

GOUVERNAIL de direction, avec son plan de dérive : entièrement au-dessus du fuselage et *en avant du gouvernail de profondeur* (à l'inverse du *Spad*) ; 2° petit plan fixe triangulaire, sous le fuselage. Gouvernail de profondeur, avec son plan stabilisateur fixe : *arrondi sans échancrure*, en forme de « *pelle* ».

FUSELAGE arrondi, avec calotte à l'avant et s'amincissant à l'arrière (*ce qui est peu apparent*).

MOTEUR fixe Mercédès 175 HP.

Confusion à éviter : avec les *Nicuport.*

THE F. E. SINGLE-SEATER FIGHTER

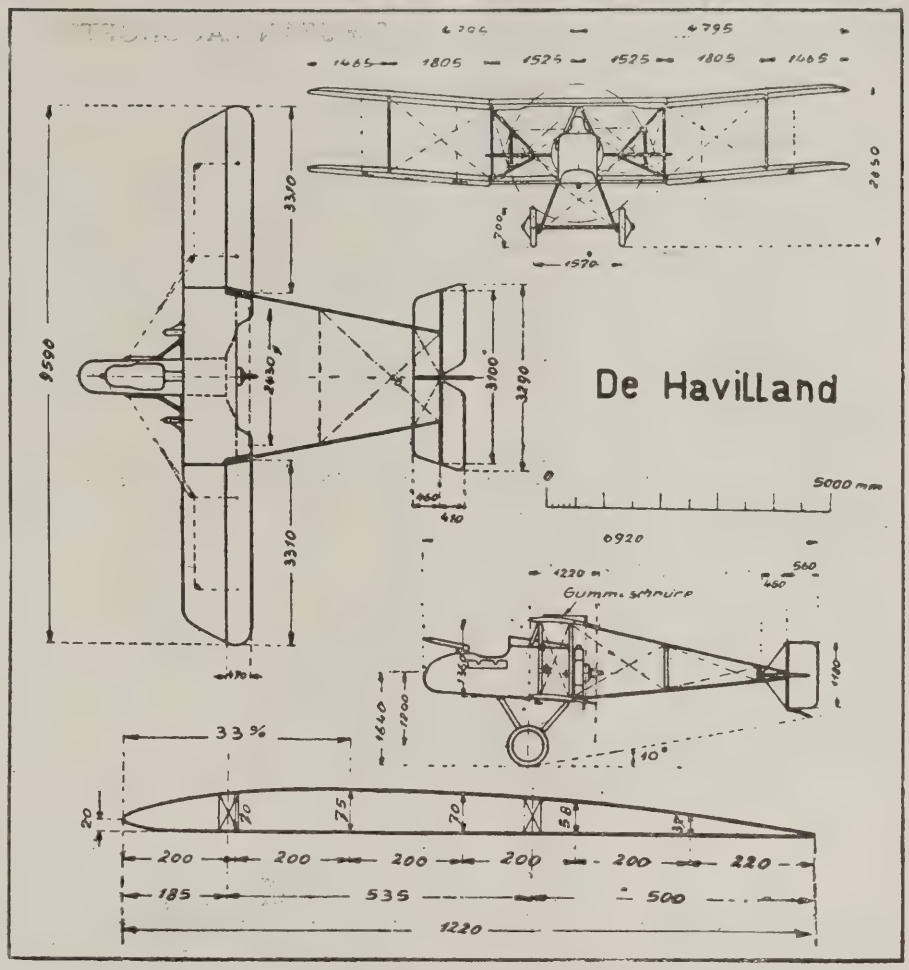
AN interesting illustrated description of a British biplane appears in a German aeronautical contemporary, which we reproduce from the British publication "Flight." The data relating to the "de Havilland," (apparently the "B. E." and *not* the de Havilland) so described by our contemporary, are preceded by the following interesting and characteristic remarks:

"It was difficult for the English constructors to produce a machine equal to the German aeroplanes, especially as regards the production of a single-seater fighter. The main desiderata in such a machine were high speed, manœuverability, climb and a free field for a machine gun in a forward direction. As English aeronautical engineering was somewhat backward, especially with regard to firing through the propeller, the construction of a tractor single-seater with the engine in front had to be discarded. The result was therefore necessarily a fighter, with the screw at the rear and an open framework carrying the tail, and it was the little de Havilland single-seater which was ordered in large quantities by the British army.

"The de Havilland ("B. E.") single-seater consists, as the accompanying illustration show, of a central portion of 3.5 metres span, to which the wings are attached at a dihedral angle. There are two pairs of inter-plane struts on each side. To the point where occur the first pair of struts the tail booms are attached. **Ailerons** of 3.31 metres length are fitted to both planes. The **ailerons** are held flush with the trailing edge by rubber cords on the upper surface. The power plant consists of a 100 h.p. monosoupape driving a four-bladed screw of 2.34 metres diameter. In front of the motor are the petrol and oil tanks and the pilot's seat, and in front of the seat is a pivot for the movable machine gun. The weight of the machine empty, is 476 kilogrammes, and with 2½ hours' fuel, pilot and machine gun, it is 722 kilogrammes. The loading is thus 35.6 kilogrammes per square metre. In spite of the great resistance of the wing bracing, the machine attains a speed of 150 kilometres per hour."

Chief characteristics of the "B. E." Fighter:

Power plant—100 h.p. Gnome Monosoupape; fuel, petrol—120 litres, oil 22 litres. Area of planes (inclusive of *ailerons*): Top plane, 10.7 sq. m.; bottom plane, 9.6 sq. m.; total, 20.3 sq. m. *Ailerons*, 4 x 1.47 sq. m.; elevators, 1.19 sq. m.; rudder, 0.67 sq. m. Angle of incidence: Main planes, 4.5°; tail plane, 0.8°. Weight, empty, 476 kg.; useful load, 246 kg.; total, 722 kg.





The F. E. Scout, referred to as the "De Havilland" by the Germans

New Aero-Motor Company

Indianapolis.—The Supreme Motors Co., Cleveland, O., will move its headquarters to Fort Wayne, Ind., where a manufacturing plant for temporary use is to be leased within a few days. The company has a capitalization of $1,000,000, and is to engage in the manufacture of automobile, aeroplane and tractor motors.

Clarence F. Jamison, of Lafayette, Ind., formerly assistant general manager of the Elgin Motor Corp., Chicago, is president of the company; Benjamin F. Cline, formerly with the Elgin company, is vice-president; Courtney M. Mitchell, Cleveland, is chief engineer; C. E. Manning will be experimental engineer, and U. P. DeHart, of Cleveland, is purchasing agent.

Made 400 Miles in Balloon

Muskogee, Okla.—Bernard von Hoffman, in the balloon "St. Louis," Albert, fourteen years old, as aid, was declared winner in the ninth international balloon race by officials of the Oklahoma Fair Association, under whose auspices the race was held. The von Hoffman brothers landed at Ripley, Miss., four hundred miles from here.

Four other balloons which went up have been accounted for. None went more than twenty miles.

Aviation Division Meeting Oct. 28

New York—Another meeting of the aircraft division of the S. A. E. Standards Committee will be held at the Bureau of Standards, Washington, on Sunday and Monday, Oct. 28-29. On Oct. 28, standards having to do with the engine and its accessories will be discussed, and on Oct. 29 standards relating to the fuselage and wings.

Next "Forces" to Train Abroad, Carrier Pigeons

Baltimore—Carrier pigeons in this city are being indexed by the government and 180 have been taken by the government so far through the local branch of the American Racing Pigeon Association. The initial consignment of one hundred was donated by fanciers and eighty were purchased from their owners. Training is to be given them in France with the American troops.



MILITARY AEROSTATICS



Spherical Balloon pilots certificated by the Aero Club of America during the week ending Oct. 6

125 E. B. Weston.
126 Glenn Phelps.
127. A. C. Duncan.
128 Emer G. Marschurty.
129 George Call Johnson.
130 Graver C. Barclay.
131 Henry A. Emmons.

Balloon Pilot Certificates

Spherical Balloon Pilot Certificates issued by the Aero Club of America during the past week

132 Harold C. Fischer.
133 Guy F. Donohoe.
134 P. J. Allan.
135 John S. McKibben.
136 Ralph H. Sarazan.
137 Philip B. Chase.

The Astra-Torres Airship

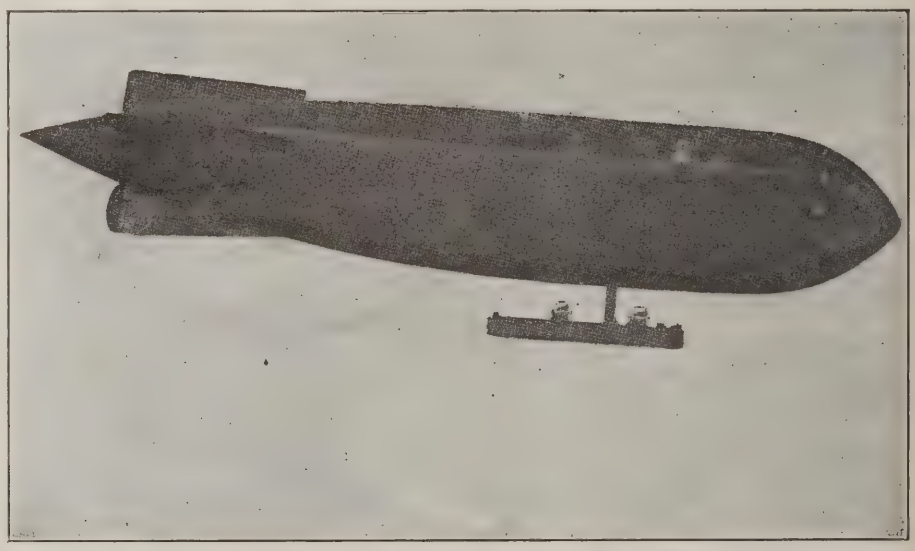
THE Torres invention has been described as scientifically perfect and extremely simple. The vessel belongs to the non-rigid class, but the whole of the suspension system is placed within the gas-bag, so that the air-resistance offered by ropes is virtually eliminated in its entirety, for the simple reason that practically no ropes are placed outside the envelope. The general principle of design may be gathered from the accompanying diagrams. It is as if three sausage-shaped balloons were disposed pyramidally—two lying side by side with one super-imposed, with the bags connected at the points where the circular sections come into contact. Thus the external appearance of the envelope is decidedly unusual, comprising three symmetrical ridges. At the points where the three bags come into contact cloth bands are stretched across the arcs, thereby forming a cord. The suspension system is attached to the upper corners of the inverted triangle thus formed, and converges in straight lines through the gas space. The bracing terminates in collecting rings from which a short vertical cable extends downwards through a special accordion sleeve to pass through the lower wall of the envelope. These sleeves are of special design, the idea being to permit the gas to escape under pressure arising from expansion and at the same time to provide ample play for the cable which is necessary in a flexible airship.

This cable emerges from the envelope only at the point or points where the car or cars is or are placed. In the British airship of this type there is only one car, but the larger French vessels are equipped with two cars placed tandem-wise. The vertical cable, after extending downwards a certain distance, is divided, one rope being attached to one, and the second to the other side of the car. The two-bladed or four-bladed propellers are disposed on either side of the car, in each of which a 500 horsepower motor is placed.

The Astra-Torres type of dirigible may be said to represent the latest expression in airship design and construction. The invention has given complete satisfaction, and has proved strikingly successful. The French Government has completed arrangements for the acquisition of larger and more powerful vessels of this design, being now in the position to contest every step that is made by Germany in this field. The type has also been embraced by the Russian military authorities. The Astra-Torres airship has a rakish appearance, and although the lines of the gas-bag are admitted to increase frictional resistance, this is regarded as a minor defect, especially when the many advantages of the invention are taken into consideration.

The Astra-Torres XVI, built for military purposes, has a volume of 812,000 cubic feet (23,000 cubic metres). Length, 457 feet (130 metres); diameter, 56 feet (16 metres). It has two nacelles, each 43 by 7½ by 7 feet (13.15 by 2.30 by 2.15 metres). There are four 200 h.p. Chenu motors and four integral propellers 12 feet 6 inches (3.80 metres) in diameter. The maximum speed is 43 miles per hour (70 kilometres) with a duration of about 24 hours. The more recent types, as the one illustrated on the cover page, far surpasses these performances.

In the diagram below the location of the parts of the Astra-Torres are shown. The letter "B" shows the balloonets which hold the air and terminates in tube extending down to the pump or ventilator (H) in the car. When the airship is completely inflated with hydrogen, as at the beginning of the ascent, these balloonets lie flat against the lower part of the envelope as the airship rises, the gas expands because of the reduced atmosphere pressure, and as well as the influence of heat with the increase of pressure, uniform inflation is maintained by the escape of a certain amount of gas through the automatic valve provided for that purpose. When the ship descends, and the increased external pressure causes a reaction of the gas until it no longer fills up the envelope, the loss is replaced by the air which the "ventilator" forces into the balloonets until the gas bag is filled to its original volume. The system is similar to that used in most of the present-day airship.



A dirigible of the British Astra-Torres type, in flight

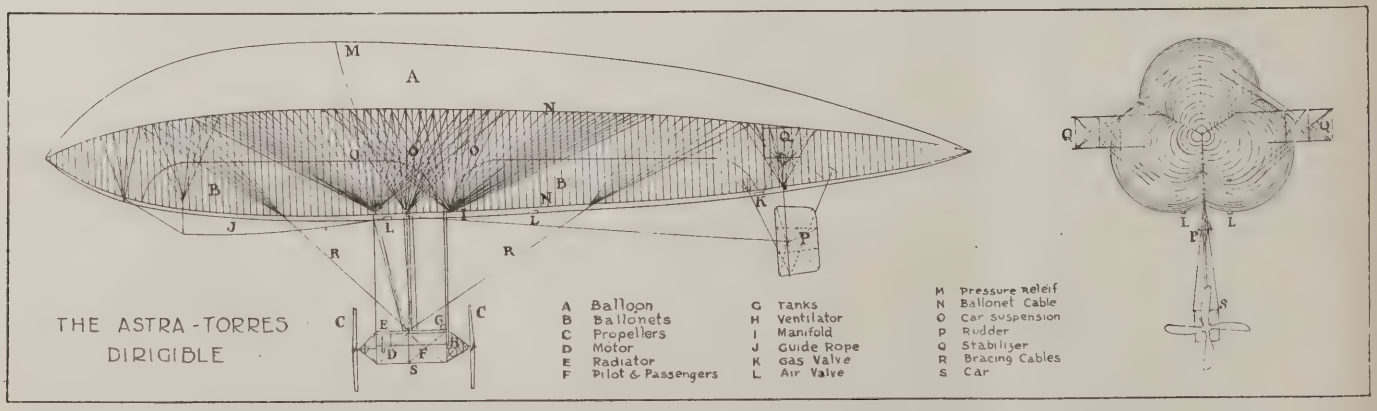


Diagram showing the arrangement of the British Astra-Torres dirigible

FOREIGN NEWS

BELGIUM

Early on Wednesday, October 10, naval raids were made on the Thourout & Lichtervelde Railway junctions and trains. Large quantities of explosives were dropped.

Another air raid over Belgium was reported officially on October 12. The statement says that naval aircraft dropped many bombs on the Sparappelhoek airdrome, despite heavy clouds and rain. All the machines returned.

FRANCE

On October 7 in the region of Doiran two raids, supported by aeroplanes were made on the enemy lines, which they partially destroyed. This is thought to be the first time aeroplanes have been so used in French raids.

Harold Willis, a Boston boy serving in the French aviation corps, who was reported killed in recent despatches, is alive and a prisoner in in Germany, according to information communicated to Senator Weeks on October 11 by Ambassador Jusserand. The ambassador's letter to Senator Weeks read:

"I am glad to inform you that I am in receipt of a telegram from my government stating that Harold Willis is alive and that it has been possible to confirm that he is a prisoner at Kalsruhe."

Paris, October 9.—The body of Capt. Guynemer, the French aviation "Ace" recently killed in action, was not buried at Poelcapelle, as stated in German reports, but was interred at Brussels in the presence of a guard of honor, composed of the 5th Prussian Division. Such is the story told by a Belgian who has just escaped from the Germans.

The burial was about to take place near Poelcapelle, when the bombardment preceeding the British attack at Ypres started. The burying party hastily withdrew, taking the body with them. The German General chanced to be an aviation enthusiast with a great admiration for Capt. Guynemer's achievements.

A revision of the list of French "aces" now places Second Lieutenant Nungesser in the lead with thirty German aeroplanes to his credit.

Nungesser is an Alsatian by birth and would be shot by the Germans as a traitor if he fell into their hands. Nungesser has been wounded more times than any other man fighting today.

GERMANY

On the various German fronts the Entente forces lost 374 aeroplanes during September, as against 87 machines lost by the Germans, according to figures given out by army headquarters. The text of the announcement reads:

"The losses sustained by the enemy aerial forces in September on the German fronts were 22 captive balloons and 374 aeroplanes, including 167 behind our lines. The remainder were brought down beyond enemy positions. In encounters we lost 82 aeroplanes and five captive balloons."

An aerial battle developed in the evening of October 11th over Zonnebeke and Zandvoorde, in which about eighty aeroplanes participated. Three enemy aviators were shot down.

High tribute to the daring displayed by his British enemies is paid by the German champion air fighter, Major Baron von Richthofen, in an interview with Baron Ompeteda, a German novelist, printed in *Die Woche* of Berlin, and summarized in *The London Daily Mail* of September 21.

According to a report sent out from Berlin and printed in *The New York Times* of July 22, Major Richthofen had brought down sixty-two enemy aeroplanes up to the first week in July, thus far outstripping the record of the late Captain Boelke, who conquered forty opponents. Lieutenant von Richthofen, a brother of the German champion, is reported to have brought down twenty-four machines up to September 1.

According to the description of his private headquarters on the western front, Major von Richthofen concentrates most of his thought and energies upon the British Flying Corps. The walls of his lair are decorated with trophies from British planes, such as propeller parts, the emblematic red, white, and blue circles cut from wings, remains of machine guns wrecked when his victims crashed to earth, and other tokens of the conqueror's prowess. Richthofen is filled with lively respect for British antagonists.

"I am a great believer," he said, "in taking and retaining the offensive. Airmen must attack. Once we are jockeyed into the defensive, it is devilish difficult to turn the tables. Above all else, we have to outwit the English in this respect. Their airmen are simply daredeviltry personified. They hardly ever take time to study the situation, but are always ready, even under most unfavorable conditions, to attack. This often results in their coming woefully to grief, but their intrepidity makes them foes to be respected. Their battle tactics differ conspicuously from the French, who adhere to the more conservative rule of attacking only when in superior force or when conditions are unusually favorable. It has been my experience that the English are not attacking now with as much vigor as hitherto. I attribute that to the circumstance that their experienced flyers, their best men, have been lost, and the newer and younger airmen have not yet had sufficient practice in actual fighting.

"There is no room for 'soft' methods in air fighting. I often attack at 300 yards, but can, of course, achieve better results at 150. Airmen cannot be governed by regard for anything but victory. Above all, they must not indulge in any sentimentality. That's something entirely unknown in an English antagonist. Indeed, he would laugh at such a thing. To give way to wishy-washy thoughts with an enemy's machine gun blazing away at you at close range can easily cost you your life."

Richthofen is 25 years old, of medium height, and muscular build. He has blue eyes and fair hair, and is described as being so shy that he creates the impression of being able to blush easily. A simple Lieutenant of Uhlans in 1912, he has risen in rank with unusual rapidity. Richthofen's battleplane is said to bear many scars inflicted by enemy bullets.

GREAT BRITAIN

Salonica:—On Oct 6 the British successfully raided Akindjali and and Bulamac, east of Lake Doiran on the Balkan Front. British aeroplanes co-operated by dropping bombs on the enemy batteries and engaging his infantry with machine guns. British aircraft also bombed Cliftlidzik, west of Demir Hissar, where a hostile anti-aircraft gun was put out of action, and Cestovo, northwest of Lake Doiran, where an ammunition dump was damaged.

On October 9 there was little flying except on the battle front, where a great deal of work was done, in spite of a strong gale and thick clouds. The enemy's new gun positions and other suitable targets were reported by aeroplanes to the artillery, which dealt with them.

A ton of bombs was dropped on Staden during Tuesday, October 9. At night two tons were dropped on Roulers, Courtrai, Menin and Legeghen stations. A direct hit was obtained on a hostile train, causing a number of explosions.

In the air fighting four German machines were brought down and two were driven down out of control. Two British machines are missing.

Owing to the weather very little flying was done Saturday, October 13. In the fine intervals a certain amount of artillery and photographic work was accomplished and the enemy's new positions were reconnoitered. One of the British patrols encountered an enemy formation of double the number of machines, and a determined fight ensued, from which four British aeroplanes failed to return. Owing to the close nature of the fighting the number of hostile machines accounted for could not be determined. Other Allied machines, which arrived too late to share in the fight, saw from a distance several machines falling out of control.

ITALY

Giant Caproni aeroplanes rained bombs on the evening of Oct. 8 upon the great Austrian naval base at Cattaro, starting fires among buildings in the navy yard and causing damage to Austrian ships in the harbor.

The Austrians met the attack with greatest vigor, but were unable to drive off the aeroplanes until nearly daylight, when the Italians withdrew without loss.

Advices from Rome indicate that the Italian attack was planned to forestall an Austrian naval demonstration that was being organized at Cattaro and Pola. The squadron started from its base 30 kilometers across the Adriatic Sea. Gabriele d'Annunzio, the Italian poet, who has won distinction as one of the most daring aviators in the war, was in command of one of the machines.

The squadron arrived at midnight over Cattro, flying at the height of 12,000 feet. The planes descended until they were only a few hundred feet over the harbor and began to drop bombs on Austrian destroyers and submarines in the bay, many of which were seen to be hit, as fires broke out immediately.

Meanwhile other Italian planes were bombing the naval depots and storehouses ashore and several fires were noted. Several Italian planes were struck in their wings with shrapnel and machine gun bullets, but were not seriously damaged.

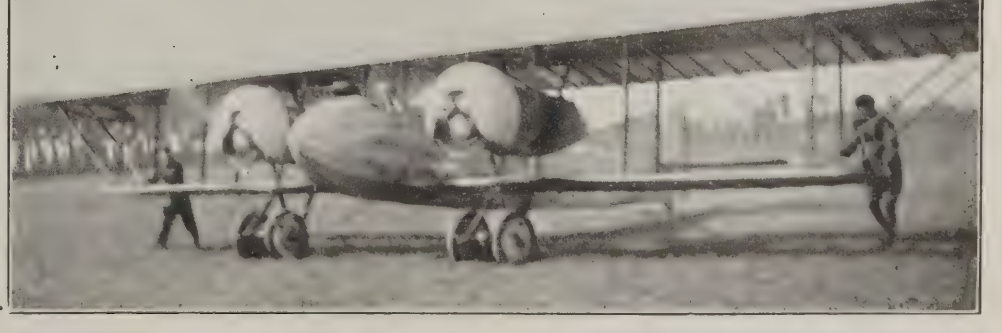
RUSSIA

In the Roumanian region, on Oct. 5, Russian airmen bombed the village of Mikloch and the Falanka station. They set fire to the sawmill at the station and the stores magazine exploded.

On Oct. 8, fourteen enemy aeroplanes approached Cerel (on the island of Oesel). Some of them fired mines on Russian transports at Aitchod. On the 9th, eight enemy aeroplanes attacked without result the batteries at Cerel and the village of Mendo, six miles to the northeast.

On Oct. 8, Russian machines dropped twenty bombs on Rodenrois station and on the Riga station. They brought down an enemy aeroplane in the Riga region. In the neighborhood of Buczacz French aviators brought down an enemy machine in flames.

The French Caudron "G-6" twin motored tractor, the latest type having a fuselage in place of the usual nacelle and tail outriggers.





MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

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29 West 39th St., New York City
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
LONG ISLAND MODEL AERO CLUB
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BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
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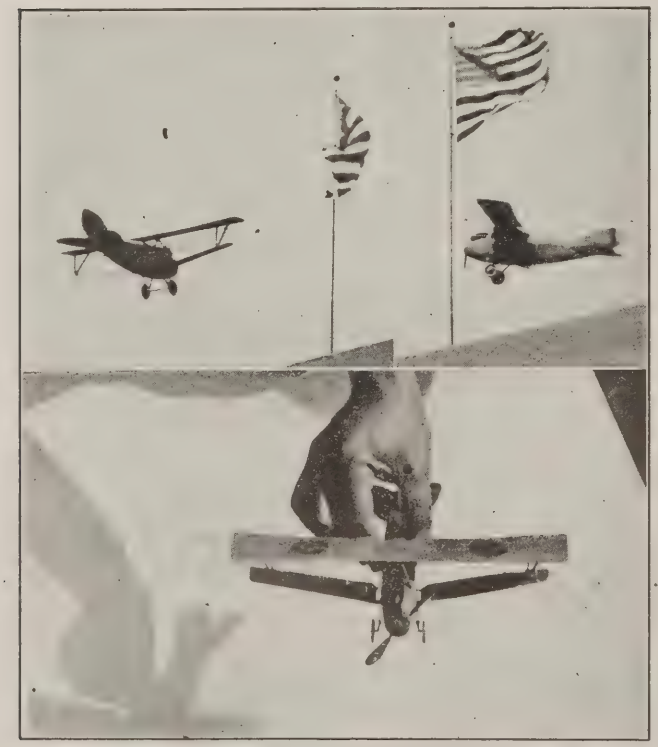
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Advantages of the "A" Type Model

MUCH has been said about the Scale Model and the position which it assumes in relation with the A type model or flying stick. Every model flyer appreciates that a scale model is truly a model aeroplane and affords a most instructive medium. No one doubts its superiority over the flying stick. But let us consider the good points of the A type, twin propeller model!

When the art of model flying was first brought to the attention of the young men of New York the tendency at that time was toward the construction of models representing full-sized machines. In the construction of these models it is needless to say that a great deal of information concerning the operation of large machines was obtained but the manner in which they were constructed was of such a nature that the majority of them was unable to fly, thus preventing the opportunity of learning just how a machine of larger dimensions performs under the various conditions. After considerable experimentation model constructors began to realize that to get their models to fly lighter material would have to be used, and to accommodate the only means of motive power at that time, rubber strands, the model would have to be built entirely out of proportion. Hence, why not copy the more successful models which were being flown by European model flyers?



A miniature war aeroplane made by Mr. John F. McMahon, a fine example of neat workmanship. The upper illustrations show a remarkable resemblance to a full sized machine in flight, and the lower view shows (by comparison with the hand) how small the machine really is. It was built as a radiator-cap ornament for an automobile.

Little by little American model flyers took to the development of this particularly interesting machine, the A type model, leaving the Scale model for future development when a more adequate means of propulsion would be obtainable. And what of it? By the use of this interesting and successful type of model, constructors were enabled to get a good idea of the performances of large machines under various weather conditions. They could also detect the operations of the different kinds of propellers and the quickest and most efficient way to make them. The wings, likewise, afforded them splendid opportunity to understand the meaning of streamline and effects of various wing curves. In the construction of models that will rise from the ground and water there is also opportunity for knowledge. As, for instance, in the case of hydro-aeroplane models the making of the pontoons is a study in itself. Not every pontoon will enable a large machine to leave the water, and it is the same with the model aeroplane. Pontoons must be made in a careful and scientific manner in order to get the best results. Perhaps there are many other features of the A type model that have not been considered, but the few here mentioned will give the reader a chance to become acquainted with the good points of the A type model or flying stick.

After a model flyer has constructed several models of this type, all of which cost him but very little, he is quite happy because his models will fly and it stands to reason that he is in a better position to build a scale model than he would have been had he attempted it in the first place. His knowledge of propellers, wings, fuselage and the most economical yet satisfactory materials to use in its construction will stand him in good stead. And when he comes to the designing and building of the model he is not so very apt to make unnecessary expenditures and is in a better position to predetermine the flying ability of his model.

As a medium for sport and cultivator of good fellowship the flying stick or A type model is in a class by itself. Ever since the formation of the first model club contests have been held in which the A type model has played the most important part. Of course, there are other types of models, but the average model flier prefers the A type model because of its simplicity and reliability. This type of model is easily adapted to contests for distance and duration from the hand, from the water and ground, speed, controlability and for numerous other events.

The advantages of the scale model, however, must not be lost sight of. It cannot be denied that it offers the most complete way to become familiar with the performances of a large machine. On the other hand the A type model is suitable for sport and in a way gives the constructor some idea of a large machine although not quite as complete as would the construction of a Scale model. Taking everything into consideration there is no reason why the Flying Stick or A type model should be abandoned right away! From the standpoint of economy and sport, it is safe to say it will maintain a good place in the model world for some time to come if not indefinitely.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

Beechisms

Sometime ago a pious young clerical prevailed on a rather profane aviator to take him for a flight. After attaining several thousand feet the motor suddenly stopped, revealing to the uttermost the aviator's gift of profanity.

The alarmed pastor excitedly demanded if there was any danger. The pilot replied sarcastically that there would be prayer instead of profanity if there was any danger.

The motor "cut in" again and the flight continued. Suddenly the motor stopped again and notwithstanding the pilot's efforts, accompanied by the usual lurid language, he was forced to alight. Just as he flattened out for his landing, the pilot was disconcerted by hearing the parson exclaim in fervid tones: "Thank God the aviator is still swearing."

* * *

We are unable to give the nature of a jailbird's wings, but can state that its flying inclination exceeds its capacity.

"I'll wait until they invent sky-hooks before I start flying," grinned a cheerful idiot.

"Then you'll sure get hung on the skyline," grinned back our sarcastic mecano.

* * *

When a fancy price is charged for an experimental propeller, it is simple robbery; but when the propeller endangers an aviator's life it is robbery and attempted murder.

* * *

The difference between poisoning by words and poisoning by food is that poisoned words may result in the assassination of a president Lincoln with immunity for the poisoner.

* * *

The greatest weakness of the Teutonic aerial force lies in the fact when the fighting aviator leaves the ground the sudden release from military coercion sets up a reaction which it would be improper to call a "yellow streak."

* * *

Since the world of invention outside Germany has been closed to that nation we are forced to the conclusion that as inventors the Germans are indefatigable copyists and infringers.

A. C. BEECH.

To the Airman

I see an Aeroplane,
Sailing high,
Far up in the bright
Blue sky.

I hear the engine,
Throbbing, roaring;
Ever thru the air
Is boring.

I see the planes,
Shining brightly,
Ever skimming,
Swiftly, lightly.

O, thou Airman,
Way up high,
I bet you thrill as
You pierce the sky.

As you look at us
Way down below,
And as we peer
At you so high above,

A mutual understanding,
A pleasant smile;
A thrill of joy as, in passing by,
We watch you dart across the sky
And hope you land safely on the field nearby.

TOM ASHTON.

"Brain Waves"

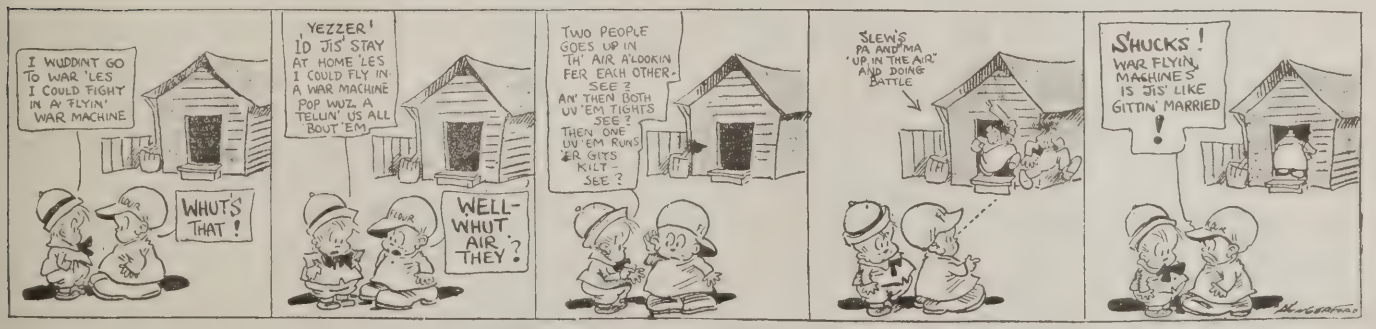
Of machinery rotary
I am a votary—
Wait while I sit down and think.
My mechanic ability—
Mental agility
I'll bring to bear in a wink:

Electric potential,
Circumferential,
Sparking plugs timed on contact.
For early ignition
On rising compression—
Now just let me think ere we act.

With cams automatic,
Adiabatic
(I've seen them laid out on the bench),
The time calculation
Of valve operation—
With instruction all printed in French—

I study and meditate,
I never hesitate,
Daily fresh problems I solve;
Yet a question recurring
My brain-box is stirring—
Why don't the damned engine revolve?

K. W. R.



SNOODLES Shows Pa and Ma are Highfliers.

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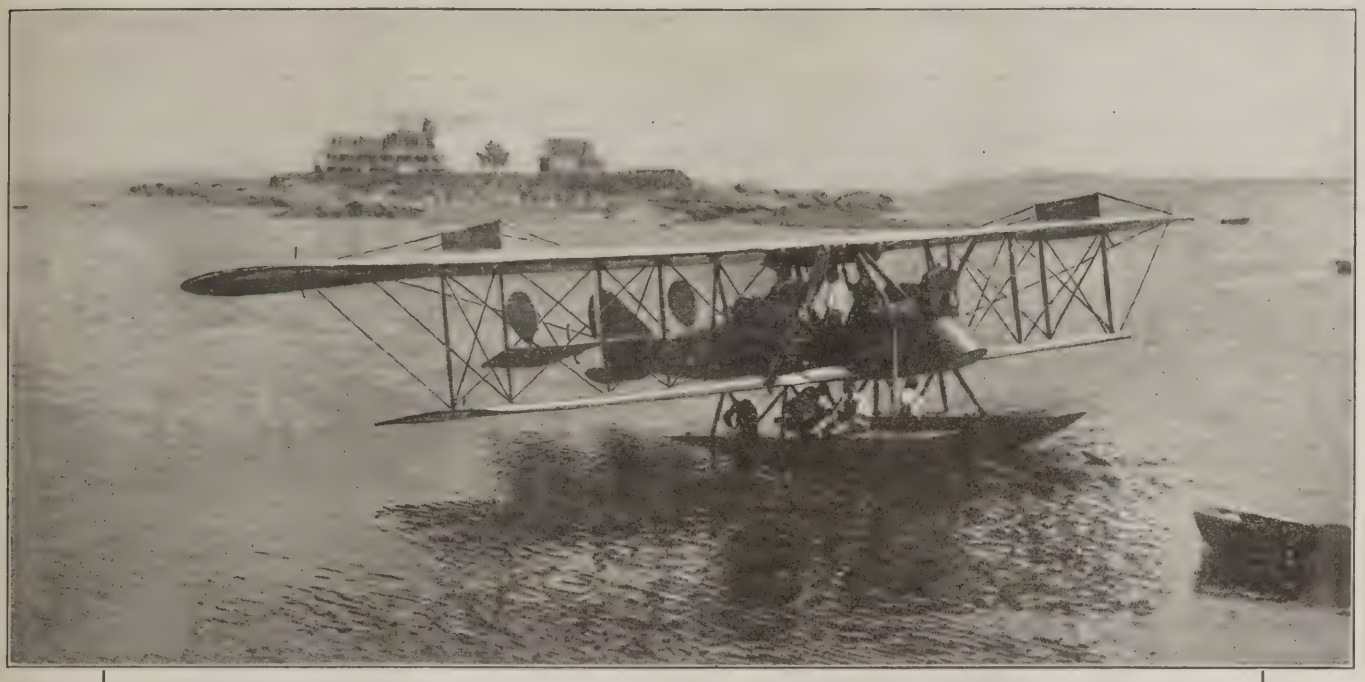
In an appreciative foreword, Rear Admiral Bradley A. Fiske describes the book as "clear, correct, and stimulating."

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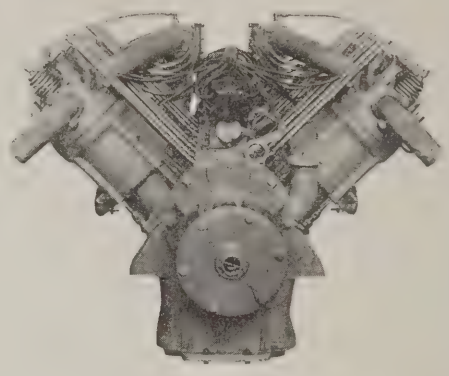
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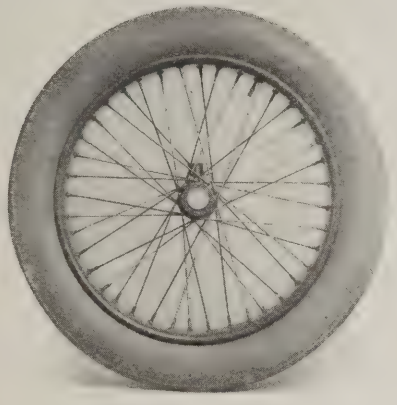
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Military Aeronautics.

(*Continued from page* 241)

First Lieut. Roy F. Jones, Av. Sec., S. O. R. C., active duty Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Rodger W. Straus, Signal Corps, to duty at War College Division, General Staff.

First Lieut. Henry N. Hinckley, First Lieut. R. B. Kirby, and First Lieut. Henry R. Shepley, to Hazelhurst Field, Mineola, Long Island, New York, for duty.

Capt. Abraham L. Lavine, Av. Sec. S. O. R. C., active duty, reporting to the Chief Signal Officer of the Army for assignment.

First Lieut. Frederic L. Baxter, Av. Sec. S. R. O. C., active duty, reporting to the Chief Signal Officer of the Army for assignment.

First Lieut. Frederic Nickerson, and First Lieut. George W. May, Signal Corps, to the Chief Signal Officer of the Army for duty.

First Lieuts. Walter J. Reed, and Ray W. Thompson, Av. Sec., S. O. R. C., active duty, at Army Balloon School, Fort Omaha, Nebraska.

First Lieut. J. Neil Patterson, Av. Sec. S. O. R. C., active duty reporting to Chief Signal Officer of the Army for assignment.

First Lieut. Kirk W. Todd, Av. Sec. S. O. R. C., active duty, at Selfridge Field, Mount Clemens, Michigan.

First Lieuts. Arthur Mitchell, Thorne C. Taylor, and Arthur McAleenan, Jr., to Hazelhurst Field, Mineola, Long Island, New York, for duty.

The following named Officers, Av. Sec. S. O. R. C., are announced as on duty requiring them to participate regularly and frequently in aerial flights from following dates: First Lieuts. H. Potter Trainer, August 7th, 1917; Cyrus F. Smythe, August 11th, 1917; Lorenzo L. Snow, August 11th, 1917; Theose E. Tillinghast, August 11th, 1917; Torrey H. Webb, August 11th, 1917; Walter P. Jacob, August 11th, 1917; Harry C. Brayton, August 14th, 1917; Junius A. Richards, August 20th, 1917; Hallam B. Peters, September 19th, 1917; Roger W. Jannus, September 4th, 1917; John H. Baker, August 20th, 1917; Logan P. McMenemy, September 14th, 1917.

First Lieut. Sidney R. Small, Signal Corps, Chief Signal Officer of the Army, for duty.

Capt. Thomas A. Grant, Av. Sec. S. O. R. C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. George E. Weir, Signal Corps, to Chief Signal Officer of the Army for duty.

First Lieut. Frank E. Werneken, Signal Corps, to Chief Signal Officer of the Army for duty.

First Lieut. Harold Imbrie, Av. Sec. S. O. R. C., active duty at Call Field, Wichita Falls, Texas.

The following named officers of the Signal Corps, to duty at Hazelhurst Field, Mineola, Long Island, New York: First Lieut. Lilburn H. Steel, William E. Birmingham, First Lieut. Joseph H. Reilly, Charles S. Pillsbury.

First Lieut. Lucius P. Ordway, Jr., Av. Sec. S. O. R. C., to Signal Corps concentration camp, Morrison, Virginia, for duty.

Major Richard B. Barnitz, Junior Military Aviator, Signal Corps, to Love Field, Dallas, Texas, for duty.

Major Goeffrey A. Bonnell, Signal Corps, to Chief Signal Officer of the Army for temporary duty, on completion to Toronto, Canada, to command the 17th Aero Squadron.

First Lieut. James T. Denson, First Cavalry, Alabama National Guard, to duty with the Aviation Section of the Signal Corps.

A board of Officers consisting of Capt. Paul Magoffin, Av. Sec. S. O. R. C., and Capt. George E. Frothingham, Medical Reserve Corps, is appointed to meet Detroit, Michigan, to examine applicants for commission in the Aviation Section, Signal Officers' Reserve Corps.

First Lieut. Ferel O. Replogle, Av. Sec. S. O. R. C., active duty at Signal Corps, general supply depot, Middletown, Pennsylvania.

First Lieuts. Bradley J. Gaylord, and Lawrence H. Richards, Av. Sec. S. O. R. C., to duty at Hazelhurst Field, Mineola, Long Island, New York.

Capt. Charles C. Ames, Av. Sec. Signal Officers' Reserve Corps, to Fort Sam Houston, Texas, Southern Department, for duty as assistant to the Department Aeronautical Officer.

Capt. John H. Alden, Av. Sec. S. O. R. C., to Chief Signal Officer of the Army for duty.

First Lieut. Frank A. Dickman, Av. Sec. S. O. R. C., active duty at Selfridge Field, Mount Clemens, Michigan.

The following named Officers S. O. R. C. will proceed to Camp Devens, Ayer, Massachusetts, for duty as follows: For assignment to the 401st Telegraph Battalion, Capt. Lewis W. Abbott, First Lieuts. Robert W. Sherland, Edward M. Stannard, John J. Dolan, Ralph H. Keller. For assignment to the 301st Field Battalion: First Lieuts. John J. Fanning, David H. Gorman, Charles G. Miller, E. J. Haines, and J. Newington.

First Lieut. William K. Norton, Av. Sec. S. O. R. C., to Hazelhurst Field, Mineola, Long Island, New York.

Capt. Gordon Reel, Av. Sec. S. O. R. C., to duty at Love Field, Dallas, Texas.

First Lieut. Charles W. Stolze, S. O. R. C., from Camp Alfred Vail, Little Silver, New Jersey, to duty Washington, D. C.

First Lieut. James S. Brown, Jr., S. O. R. C., active duty, reporting to the Chief Signal Officer of the Army for assignment.

First Lieut. Wm. A. Fox, Av. Sec. S. O. R. C., to report to the Chief Signal Officer of the Army for duty.

Capt. Albert D. Smith, Av. Sec. S. O. R. C., to Park Field, Millington, Tenn., reporting to Commanding Officer, Signal Corps Aviation School for duty.

First Lieut. George Perkins, Av. Sec. S. O. R. C., to Hazelhurst Field, Mineola, Long Island, New York, for duty.

First Lieuts. Elliott Cobb, and Rutgers S. Kasson, Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York, for duty.

First Lieut. William A. Thompson, Av. Sec. S. O. R. C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

Capt. Daniel H. Henry, Av. Sec. S. O. R. C., from Hazelhurst Field, Mineola, Long Island, New York, to Chief Signal Officer of the Army for assignment.

First Lieut. William H. Warren, Av. Sec. S. O. R. C., to Signal Corps general supply depot at Middletown, Pennsylvania, for duty.

Assignments

First Lieut. T. E. P. Rice, Aviation Section, O. R. C., to Essington, Pa.; First Lieut. Edward Sampson, Aviation Section, O. R. C., to Princeton, N. J.; First Lieut. R. R. Showalter, Aviation Section, O. R. C., to Rantoul, Ill.; Major Raycroft Walsh, Signal Corps, will proceed to Camp Kelly, Texas; First Lieut. R. G. Woodcock, Signal Corps, to chief signal officer Washington.

Lieut. J. H. McCawley, Aviation Section, O. R. C., to Fort Omaha, Nebraska.

The following officers of the Aviation Section, O. R. C., will report to Mineola, N. Y.: First Lieuts. A. R. Curphey, Alexander McLeod, B. E. Armstrong, Lucas Proudfit, Jr., R. C. M. Page, J. W. Osgood, W. M. Conant, Jr., F. L. McCordic, G. S. Taylor and F. S. Soule.

First Lieuts. A. A. Brody and H. A. Clark, Aviation Section, O. R. C., to Mineola, N. Y.

The following officers of the Signal Corps will proceed to Mineola, N. Y.; First Lieuts. N. M. Lerner, W. G. Morrow, H. B. Ramage, W. M. Pegram, Leo Smith, Frederick Bowne, Jr., A. L. Garret and C. E. Grevemberg.

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AERIAL AGE
WEEKLY

Vol. 6, No. 7 | OCTOBER 29, 1917 | 10 CENTS A COPY

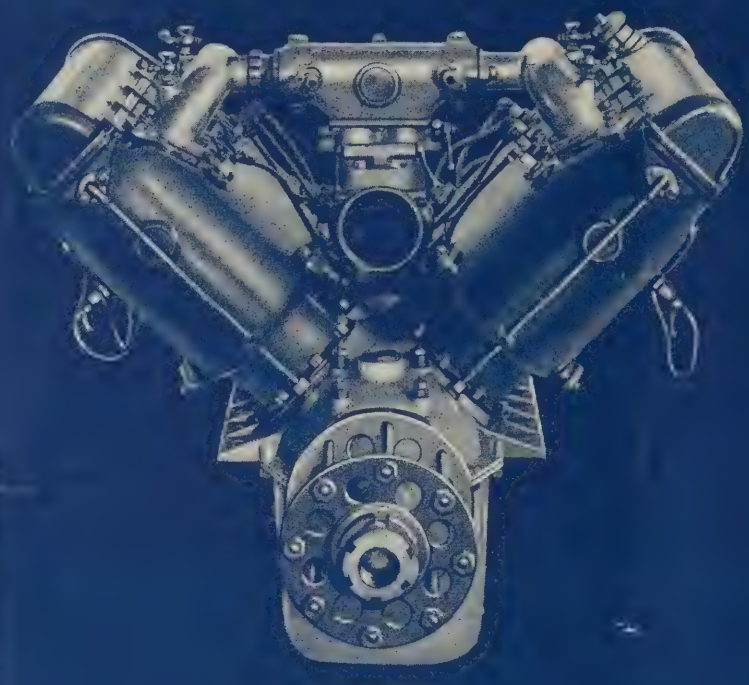


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VOL. VI. NEW YORK, OCTOBER 29, 1917 No. 7

WASHINGTON OFFICIALLY RECOGNIZES VALUE OF LARGE MACHINES

Germany Rushing Huge Air Fleet—United States Must Greatly Increase Its Aerial Program

WASHINGTON has officially recognized the value of the large aeroplane, and the evidence that Germany is rushing work on huge air fleets will necessitate the United States greatly increasing its aeronautic program.

Aerial warfare will take on proportions by next spring which will make the imaginative fiction of H. G. Wells and other writers appear tame in comparison with the actual happenings. The flyers will not go out alone or by twos and threes or even by the dozens then, it is predicted, but will be marshalled for their trips of destruction by the hundreds.

Persons in touch with the advance of military strategy abroad say that the aviation programs are taking on an importance which actually are overshadowing almost all else.

The British authorities, according to information reaching here, have awakened to the immense effectiveness of the aeroplane and are anticipating the demands of the people by embarking on an aeroplane construction program which would have been characterized as preposterous, if not impossible, not more than a year ago.

France is joining in the campaign, but it is on the United States that the Allies are counting for most substantial aid in turning out aeroplanes in quantity, American experts early having adopted the idea that quantity production in the present circumstances would count more effectively in winning the war than striving toward perfection of quality at the sacrifice of numbers.

Germany at Work to Meet America in Air

The Reuter correspondent with the French army says information in the hands of the French General Staff shows the Germans are making feverish preparations to meet the Americans in the air next spring.

The number of German battleplanes is to be doubled during the winter. Aeroplane and motor factories throughout Germany are being enlarged.

The Fokkers, which are building great fleets of fighting biplanes and triplanes, remarkable for speed and climbing powers, have taken over the great Perzina piano factories in Schwerin.

For bombing formations, heavy three-seated machines are being built to carry nearly a ton of bombs apiece. When loaded they will be able to climb 12,000 feet in thirty-five minutes, it is stated.

Secretary Baker's Statement

The statement which Secretary Baker made recently, and which was reprinted in AERIAL AGE, was most encouraging. The result of the work are not yet visible, but it is enough to know that we shall soon be ready to reinforce our Allies in their great campaign of air warfare against the deadly enemy who has been using his big machines chiefly to horrify civilians, to kill and maim women and children and old men. The war may not be won in the air. The blows we shall presently strike on the land, together with our Allies, may be the principal factor in the victory that is sure to come. We have a navy eager to get into the fray. But the American program for military aviation shows that we shall be ready, when the time comes, to combat with all the Taubes and Gothas the Germans can send aloft, to put new obstacles in the way of the German artillery, to pass over the enemy's lines, and let the Germans know that we have not entered this war without a firm determination to do our share in all the operations and the means to put it into effect.

NATION'S AVIATORS DROP LIBERTY LOAN POSTERS HERE AND ABROAD

AMERICAN aviators in France, the Treasury Department announces, flew recently over the German lines dropping tens of thousands of Liberty Loan posters.

Large supplies of the posters were sent some time ago to General Pershing and arrangements were made to have American aviators on the western front shower the German lines with them simultaneously with the aerial campaign of dropping paper bombs from coast to coast in this country.

The posters selected for use on the front depict Uncle Sam with an army of millions and an air fleet of tremendous proportions. Another poster selected for this work was the one depicting the Statue of Liberty.

Aviators from Mineola Camp Cover Wide Area

Mineola, L. I.—Six aviators from Mineola spread the Liberty bond message over a wide area October 20, and were the means of the aviators in camp purchasing $50,000 worth of the bonds. Colonel V. La Rockwell arranged the flight. Each aviator distributed 8,000 of the appeals.

Major A. W. Butts and Captain Thomas Hitchcock, the former polo star of Meadow Brook, flew over Manhattan. They were joined in their flight by two aviators from Central Park, L. I., Acosta and Holterman.

Major George W. Krats and Lieutenant Simonson flew over the camp at Wrightstown, N. J. Lieutenant Haggerty and Lieutenant Stepson went directly east to Camp Upton.

All of the men also dropped little wooden crosses like the famous German Iron Cross. On the red side was printed "Buy, buy a Liberty bond—Bye, Bye Kaiser."

On the black side was:—"Don't buy a Liberty bond! I hereby award all American citizens who can afford to and do not buy Liberty bonds to wear this honorable insignia in proof of their devotion and loyalty to me. Signed, Kaiser William."

Eight Aeroplanes Drop Appeals on Columbus

Eight aeroplanes raided the capital of Ohio. Bombs were dropped on the State House and the downtown section of the city. The aviators then circled over Ohio State University and after dropping bombs landed on the university campus.

The aeroplanes flew in squadrom formation from the Wilbur Wright army aviation school, near Dayton, as a part of the Liberty Loan campaign. The bombs they dropped were urgent appeals to the people of Columbus to help the government win the war against Germany by buying Liberty Loan bonds.

The first of the aeroplanes—five of them—reached Columbus about eight o'clock this morning, circled around the city and landed on the Ohio State University campus. The trip was made to Columbus in fifty-five minutes and without serious accident. Lieutenant Paul Goldsborough, who commanded the first squadron, ran short of gasolene while flying over the city, but was able to volplane to a safe landing at the university field.

The second squadron, of three, reached Columbus about half-past nine o'clock, dropped the paper bombs on the State House and business section and also made perfect landings.

Four Aeroplanes Participate in Raid on Cincinnati

Four aeroplanes from the Dayton Aviation Field reached the outskirts of Cincinnati and dropped Liberty Loan literature. Under orders from the commanding officer of the aviation field they did not fly over the heart of the city owing to the lack of a proper place to alight in case of accident.

Five Balloons Take Part in St. Louis Celebration

Four army aeroplanes from the aviation field near Belleville, Ill., and five balloons from the St. Louis aeronautical field dropped Liberty Loan "bombs" on St. Louis.

Two Italian Aeroplanes Fly Over Parade at Norfolk

Twenty-five thousand men, women and children marched through the streets of Norfolk October 20. Three thousand marines and sailors and ten thousand school children were in line.

Five Italian aviators, including Captain Resnati, marched with the Italian organizations. While the parade was in progress two Italian aeroplanes flew over the parade and dropped paper "bombs" in the streets.

THE END OF THE ZEPPELIN RAIDER

WHEN half of the squadron engaged in the latest aerial attack on England was either captured or destroyed in France and only one of the eight ships got back to Germany undamaged, the Zeppelin, as an instrument of punishment, was decisively disposed of. A better type may possibly be developed in due time, but it is manifest by now that the type in use at present is a failure, even if the raid recently was attended with "peculiar success," as the official statement of Berlin proclaims and as, indeed, the London reports virtually admit. In a word, the Zeppelin does not pay.

Apparently, much anger has been aroused in England by the extraordinary immunity enjoyed by the airships in their cruise over London. The success of the defensive measures used on former occasions had convinced the public that airships were no longer to be feared, that after the loss of half a dozen Zeppelins in more or less abortive attacks the Germans would never venture to use them again for this purpose.

The indignation of an English critic who speaks of the event as "a shameful episode in the annals of British aerial defence" is understandable, but not altogether reasonable. On a cloudy night it is often impossible to see a Zeppelin flying at a great height, and the ear would be a useless guide if the motors were successfully silenced, as it is said they were on this occasion. The seeming failure of English land defences is therefore easily accounted for. Whether the aeroplanes that went up in pursuit found the invaders or had anything to do with their ultimate fate it is difficult at present to determine. The Germans themselves attribute the erratic course they took to the accident of a dense fog, in which they lost their bearings. However that may be, it is certain that all the ships brought down were attacked successfully in broad daylight, the first victim falling between 6:30 and 7 o'clock in the morning.

There is no doubt that in future the Germans will be obliged to depend on aeroplanes for raids of this kind. The wonder is that they returned to the Zeppelins at all, for the recent series of raids, which were by no means so formidable as they might have been, showed the superiority of the aeroplane in several important respects. According to some estimates, there were not more than thirty engaged in any of these attacks, but let us suppose that there were twice as many and that the defences had proved so miraculous that the raiding force had been utterly annihilated. That would have been an amazing achievement, yet in point of cost the destruction of sixty aeroplanes would scarcely equal a single Zeppelin, and the Germans have now sacrificed no fewer than five, and perhaps seven, Zeppelins in one night's raid.

It will be seen, then, that in point of expense they can much better afforded to use aeroplanes, provided they can turn them out fast enough and find enough pilots to man them. Moreover, sixty modern aeroplanes could carry a much greater number of bombs than a Zeppelin, and with reasonable luck do much more damage in a short time. It is probable, then, that the airship will be restricted in future to the more modest function of scout, and that before long we shall hear of an aeroplane raid surpassing any hitherto attempted.—*Editorial in N. Y. Tribune.*

The Plain Duty of Every American

YOUR Duty, as an American citizen, is plain, definite and imperative. Your sons and your neighbors' sons are going abroad to fight for their country, their flag, their homes—and for YOU.

They cannot fight without food, shoes, clothes, bread and bullets.

The Government looks to you for the money to buy these things. Your Duty is to lend—not give—this money.

It is more than Duty—more than patriotism—it is a privilege to buy Liberty Bonds.

The money you pay for them will help win the war—help keep our soldiers fed, clothed, armed and protected—help keep your country safe for Democracy.

The United States Government guarantees to pay your money back. It pays you interest on your money, semi-annually.

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The News of the Week



Huge Caproni Makes Record Flight

Mineola, L. I.—The capabilities of Italian aircraft were demonstrated October 22d by the arrival of two Italian machines at the field of the Mineola Aviation School after non-stop flights from Langley Field, near Norfolk, Va. The first was a Pomilio biplane scout, piloted by Lieutenant Atilio Baldioli, which made the 330 miles in two hours and fifty-five minutes. The second, a big Caproni biplane, was piloted by Captain Antonio Silvio Resnati, and carried eight passengers. It took him four hours and twenty-five minutes to make the trip, but he established an American record for long-distance flying with such a load.

Captain Resnati was accompanied on his trip by both American and Italian officers, and reports of the experiment will be made to both Governments. Lieutenant James Erickson, of the United States Army, took photographs all along the route. Lieutenant Baldioli started at 10:05, with Captain L. B. Lent, U. S. A., as a passenger.

Shortly before 1 o'clock students and instructors who were flying about the Mineola field saw an aeroplane coming up from the south. Its size and type were easily distinguished by the officers on the ground, and word spread that the Pomilio machine was coming. In a few minutes Lieutenant Baldioli had brought his machine down on the field, and was surrounded by an eager group of students.

About 4:15 o'clock, Lieut. Col. Rockwell, commandant of the school, sighted the Caproni coming down from the northwest. It was at first thought that she had flown up the Hudson and around to the north of the city, but Captain Resnati said later that he had come north from Jamaica Bay, and then had circled around to the field. Ten instruction machines were in the air when the Italians flew over the field, and the smaller planes circled about and gathered in from all sides in greeting as the big Caproni swept around the field, then turned and volplaned down.

In the earlier part of the trip Resnati followed the coast line, but when he rose to a higher altitude at Asbury Park he cut out to sea a little and drove straight for Staten Island. Upon getting over the island he turned a little eastward again, crossed over Jamaica Bay and then down to Mineola.

Resnati's passengers were Captain A. W. Hill, C. A. C.; Lieutenant M. W. Pollock, who represented Brig. Gen. George O. Squier, head of the Army Aviation Service; Captain Carlo Tappi, of the Italian Aviation Commission, who sat at the alternative controls ready to take charge if Resnati wearied: Lieutenant A. Testoni, Corporals J. V. Angelo and Giovanni Basso, Francisco Calletti, mechanician, and Lieutenant Ericson, the American photographer. All of them said that they felt in tip-top condition.

British Mission to Honor Orville Wright

Lord Northcliffe, accompanied by some of the members of the British War Commission, has left on a long tour of inspection of munition and other factories, embracing Cleveland, Chicago, St. Louis, Kansas City and Dayton, Ohio, where he will present the Royal Albert Medal for aviation to Orville Wright.

He will speak by request on food conservation and the shipment problem, and is expected to reach Washington early next month.

Photo Experts Wanted for Signal Service

An appeal to secure the experts in photography necessary for service in France has been issued by the Signal Corps. The appeal was sent to all newspapers and news syndicates, asking them to release men for work with the American armies. Men who can work with the required speed are few in number and mostly connected with news photography.

These men will form photographic development squadrons, working either in small laboratories or in motor lorries closely behind the lines and responsible for the immediate development and printing of all photographs taken by America's air forces. Owing to the importance of speed in army tactics, plates must be developed, printed, and placed in the hands of the intelligence officer for transmission to headquarters in about 10 minutes from the time they are received from the aeroplane.

Candidates for this work are asked to write the Signal Corps, Photographic Division, Washington, or to enlist at their nearest recruiting office as in the Signal Corps. There will be a brief period of military training for those accepted who will become the foundation of the laboratory force the United States Army must build up. This force will be large and opportunities for advancement correspondingly good.

Our Aviators in Italy

Rome.—A dispatch in the N. Y. *Times* states that near a small town in Italy some Americans are training for aviation service. The *Giornale d'Italia* says that they already have acquired a practical knowledge of piloting and that they have given proof of their perfect discipline and seriousness of purpose. Their instructors have expressed the greatest satisfaction with their work.

The inhabitants of the town came out in crowds at their arrival to welcome the allies who had crossed the ocean from the country to which so many Italians had emigrated. They display the greatest curiosity in watching the Americans in their leisure hours playing tennis and baseball, which are unknown in that part of Italy.

The Italian papers regard this first group of American fighters as a promise of future contributions which the Republic will give to the cause of right and justice.

The New Eye of the Army

The new eye of the Army was vividly described before an audience consisting chiefly of Army and Navy Officers, at the Club rooms of the Capital Camera Club, Washington, D. C., October 18, 1917.

J. A. Daws, of the Wollenack Optical Company, Rochester, New York, came to Washington at the request of F. L. Pitmann, President, and H. J. Odenthall, Chairman of the educational committee of the club. Mr. Daws illustrated the new Aeroplane Lenses recently invented by his company.

There were many difficult problems encountered in the experimental stage of producing a lense of this type. One by one these were corrected until it is now entirely perfected. He exhibited slides and photographs made from an altitude of 10,000 feet and more. They were so sharp that the audience could pick out the various objects easily.

Commissions in Signal Corps Being Held Up

Gen. Bliss, Chief of Staff of the Army, has ended the practice of commissioning officers from civil life to the staff corps of various branches of the Army, and calling them into active service before actual need of their services exists. Commissions in the Signal Corps, Medical and Quartermaster Corps have been specially indicated. The effect of the order will be to hold up temporarily a number of commissions including those of many men of the flying section of the Aviation Service, who have been graduated from the ground and flying schools. In no case, however, will any man whose services are needed fail to get a commission eventually. Hundreds of commissions, it is said, have been issued with the understanding that when a place developed which the holder can fill he would be assigned to that duty.

School for Starting-Lighting Systems

Flint, Mich.—A course in starting, lighting and ignition systems has been started by the Industrial Fellowship League school of automobile trades. The course will cover the theory and service common to all systems with particular study of the Delco, Auto-Lite, Westinghouse, Gray-Davis and Bijur.

Hamilton with Dayton-Wright

Harry Hamilton, assistant purchasing agent of the Dayton Engineering Laboratories Co., Dayton, Ohio, has become purchasing agent for the Dayton-Wright Airplane Co. He is succeeded at the Delco factory by Bert Hutchings, who in turn is succeeded by J. B. Shepard.

Sperry Loops in Flying Boat

A flying boat looped the loop Oct. 16 for the first time, when Thomas Dixon, Jr., and Lawrence B. Sperry accomplished the feat in Marion Sulzberger's Curtiss F boat a mile in the air above Smith's Point, Mastic, L. I., with twenty other members of Aerial Coast Patrol Unit No. 3 looking aloft at them. The test demonstrated that a flying boat properly constructed can be looped in, which has hitherto been considered an impossibility.

Springfield Co. to Use Liberty Motor.

Springfield, Mass., Oct. 15—The Springfield Airplane Corp., with J. S. White, president, has entered the field in Washington for Government work. It will use the Liberty motor.

Whitehead Aircraft Co. Appoints American Representative

Basil Bancroft, the American representative of Whitehead, Ltd., Richmond, Surrey, England, is in New York on important contract matters, and to make arrangements with American aircraft manufacturers who desire to assemble their machines abroad.

Whitehead has already furnished the British Government with several thousand flying machines, delivered by air route to the firing line, and they are the manufacturers of most of the Sopwith machines.

Mr. Bancroft, who speaks with a marked English accent, surprised his interviewers with the fact that he was American born, and that the head of his house, Mr. J. A. Whitehead, is also an American, born in California. This is particularly gratifying to American aircraft developments when it is considered that Whitehead, Ltd., occupies probably the foremost position in Great Britain among manufacturers of commercial and war-time land craft.



Quentin Roosevelt, son of Ex-President Theodore Roosevelt, at one of the French aviation fields, "somewhere in France."



View of the interior of the Pomilio aeroplane factory at Turin, Italy

Wright to Make Aeros for Commercial Use

Dayton, O.—Orville Wright is ready to announce an invention that will revolutionize the manufacture of aeroplanes and make them cheap as "flivvers," it was reported here recently.

"I'm experimenting with wing models to increase the efficiency of plane surfaces," Wright told an interviewer. "Big battle planes don't interest me very much, except that I know they are needed to end the war, so we may tackle the aeroplane for the uses of peace.

"What is wanted is a comparatively low powered machine, say, of 100 horsepower, whose wing surfaces are so efficient and whose inherent stability is so high it will not require a big field to alight in.

"After the war flying will become safe, popular and comparatively cheap. As soon as the war is over I expect to see the whole country mapped out with air highways. Along these routes, say every seven miles, there will be alighting stations and hangars.

"With these airdromes so near to each other as this, it always will be easy for an aviator to make a safe landing in case of engine trouble. While flying a half to a mile above ground—a modest altitude nowadays—it will be easy to glide to safety if you are stalled midway between stations.

"We already have an air route between here and Indianapolis, with airdromes seven miles apart, and I am looking forward to the rapid extension of this system as soon as the war is over."

Ruth Law Thrills Soldiers in Flight at Camp McClellan

Camp McClellan, Ala.—Thirty thousand soldiers watched Ruth Law, the woman aviator, perform spirals and loops in an aeroplane above the camp. Low hanging rain clouds and a constant drizzle made the performance the more spectacular.

U. S. Girls Flood Our Aviators with Notes

Mr. Robert Prew, International News Service Staff Correspondent in Paris, sends the following interesting despatch to his syndicate. Every mail from the United States carries to the Lafayette Escadrille a big sheaf of letters to the various American youths flying for France. Just as "matinee idols," movie stars and champion prize fighters receive numerous notes from unknown feminine admirers, so the American aviators are weekly the recipients of scores of notes from women in America.

Lieutenant Raoul G. Lufbery, formerly of Wallingford, Conn., who has just downed his 13th German battleplane, naturally gets more letters than any of the others. But Lieutenant William Thaw, of Pittsburgh, runs him a very close second.

"Steve" Bigelow, of Concord, Mass., also is very popular with the gentler sex on the Western side of the Atlantic.

The younger men in the Lafayette Escadrille, whose names are not so well known to the newspaper reading public in the United States, receive fewer missives, but the number is mounting. Among them are "Doc" Rockwell, of Cincinnati; "Ted" Parsons, of Springfield, Mass., and Willis Haviland, of Chicago.

Many of the girls who write to the pilots enclose their photographs and ask for autographed photograph in reply.

The fliers from the United States have introduced the "American breakfast" to their French companions. The French airmen are satisfied with a couple of rolls and a cup of coffee before setting out for a hard day's work in the clouds, but the Americans demand ham and eggs, fruit, cereals and maybe pancakes to top with, as well as plenty of hot coffee before going up to give battle to the Boches.

Harvard Aviator Killed

Chattanooga.—Samuel W. Skinner, a Harvard graduate attached to the French aviation corps, has been killed on the Western front, according to a telegram received by his aunt, Mrs. F. B. Thomas. No detail were given. Skinner's home was in Cincinnati.



King George V an interested visitor at one of the British aerodromes. The machine shown is the S. E. 4

Looped-the-Loop in Seaplane

Newport News, Va.—Edward Stinson and Carl Batts, aviators at the Atlantic Coast aeronautical station, "looped-the-loop" twice in a twin-motor double-pontoon seaplane of two tons capacity here in July, thus establishing what is said to be the world's record for looping in a machine of this weight.

Curtiss Plant Raises Wages

Buffalo, N. Y.—Increases in wages which ultimately will amount to $8,000,000 a year were announced by the Curtis Aeroplane & Motor Corporation recently. A 5 per cent advance, applicable to all employees, becomes effective at once. A premium system has been adopted, which will make it possible for skilled workmen to add as high as 30 per cent. to their wages.

In addition to these advances by the company, President William A. Morgan will distribute as premiums $150,000 in Liberty Bonds.

Congressman Up In the Air.

Hartford, Conn.—John Q. Tilson, Representative in Congress from the Third Connecticut district and a member of the House Committee on Military Affairs, and Mrs. Tilson were passengers Oct. 18 in an army balloon on a trip from the Collegiate Balloon School at Rockville, of which Everard Thompson is the head. With Chief Pilot N. H. Arnold Mr. and Mrs. Tilson ascended at 9 o'clock in the morning in one of the new balloons and about three hours later made a landing near Long Meadow, Mass.

There Mr. and Mrs. Tilson gave their places in the balloon to Col. William H. Hall of Willington and his daughter, Miss Doris Hall. Pilot Arnold intended to land Col. Hall and Miss Hall at the army encampment at Eastfield, Mass., but instead landed near Holyoke. Congressman Tilson expressed himself as greatly pleased with the trip and with conditions at the balloon school.

Plan Air Service for World When War Ends

London—The Daily Express says that as soon as the war is ended aerial navigation plans which are being drawn up by Lord Northcliffe's committee, appointed by the Government, will be put in operation step by step, and the ends of the world will be brought together by long-distance aeroplane service.

The Express says it has information that if favorable weather conditions prevail it is likely that the Atlantic will be crossed by an aeroplane before the end of this year.

Plans are being laid for regular air service, not only to America, but to India, South Africa and Australia. If they are carried out Melbourne will be brought within eight and one-half days of London; India, three days, and Capetown, four or five. The bee line to Capetown would be across the Sahara, but the winds of the desert raise obstacles to this route, and the route chosen is by way of Malta, Cairo, Khartoum and Victoria Falls.

The Express says that the machine which will be used for these world journeys will be of the type developed by Handley Page, will travel 200 miles an hour, will have multiple engines to avoid the necessity for descending if one engine gives out, will carry four or five passengers, and will be able to cover about 3,000 miles in fifteen hours. Two pilots will take turns at the wheel.

Lufbery Brings Down His 13th German Plane

Paris.—Lieut. Raoul Lufbery of Wallingford, Conn., member of the Franco-American Flying Corps, who has scored many victories and recently was cited in French Army orders as an "incomparable pilot," is said to have brought down his thirteenth enemy machine.

William Thaw Heads Lafayette Fliers

Paris.—William Thaw now is chief of the Lafayette Escadrille. He is the only American who ever held such a command in the French army. He replaces Capt. Thenault, who has directed the American flying corps for many months. Lieut. Maison Rouge, the second in command, has been transferred to another unit, being succeeded by Lieut. Fauverty, who already has won the Legion of Honor and the Croix de Guerre for brilliant services.

It is expected that Thaw will be promoted soon to the rank of captain. It also is very probable that when the Lafayette Escadrille is made a part of the America Army Thaw will retain his command and rank. All members of the escadrille, with the exception of Sergeant Parsons, have passed the examinations held by Major Edmond Gros qualifying them to enter the American aviation service.

For several months, at least, Parsons has announced his intention of remaining in the French service. The escadrille was mentioned officially and praised for bravery in the last battle of Verdun.

NAVAL and MILITARY AERONAUTICS

Signal Corps Aviation Fields All Named in Honor of Fliers

Following is a list of Signal Corps aviation fields, with a brief statement of how and why they received their names:

Call Field, Wichita Falls, Tex., is named for First Lieut. Loren H. Call, who reported for aeronautical duty at College Park, Md., October 19, 1912. Lieut. Call belonged to the Coast Artillery Corps, to which he was appointed from civil life. In the winter of 1912-13, he and Lieut. E. L. Ellington were sent to Palm Beach, Fla., where they remained until the spring of 1913, in charge of the Signal Corps aviation station at that place. From Palm Beach Lieut. Call was ordered to Texas City, Tex., and it was there that he was killed in an aeroplane accident July 8, 1913. Lieut. Call's home was in Washington, D. C.

Chandler Field, Essington, Pa., is named in honor of Second Lieut. Rex Chandler, Coast Artillery Corps, who reported for aeronautical duty at the Signal Corps Aviation School, San Diego, Cal., March 15, 1913. On April 8, 1913, while making his first flight, the hydroaeroplane in which he was a passenger, fell into San Diego Bay and Lieut. Chandler was caught under the machine and drowned.

Was Naval Academy Graduate

Ellington Field, Houston, Tex., is named in honor of Second Lieut. E. L. Ellington, a graduate of the United States Naval Academy, who was transferred into the cavalry arm of the arm and was detailed to aeronautical duty at the Signal Corps Aviation School, College Park, Md., November 14, 1912. In the winter of 1912-13, he and Lieut. Call were at Palm Beach, Fla., in charge of the Signal Corps aviation station at that place, and in the spring of 1913 Lieut. Ellington was ordered to the Signal Corps Aviation School at San Diego, Cal., where he was killed in an aeroplane accident November 24 of the same year. Lieut. Ellington's home was near Raleigh, N. C.

Gerstner Field, Lake Charles, La., is named in honor of Second Lieut. Frederick J. Gerstner, Tenth Cavalry, a graduate of the United States Military Academy, who reported for aeronautical duty at the Signal Corps Aviation School, San Diego, Cal., September 26, 1914. On December 21, 1914, he was drowned, swimming ashore from a floating aeroplane while participating as passenger in the annual Mackay trophy contest.

Killed at College Park, Md.

Hazelhurst Field, Mineola, Long Island, is named in honor of Second Lieut. L. W. Hazelhurst, Jr., a native of Georgia and a graduate of the United States Military Academy, who reported for aeronautical duty at the Signal Corps Aviation School, Augusta, Ga., March 2, 1912. On June 11, 1912, while making a flight at College Park, Md., as passenger in an aeroplane undergoing acceptance tests, the machine crashed to the ground and the pilot and Lieut. Hazelhurst were both killed.

Kelly Field, San Antonio, Tex., is named in honor of Second Lieut. G. E. M. Kelly, Thirtieth Infantry, who, after a course of training at the Curtiss Aviation Camp, San Diego, Cal., was ordered to San Antonio, Tex. While attempting to land, in order to avoid running into a tent and thereby possibly injuring several others, he fell to the ground and was killed May 10, 1911.

Love Field, Dallas, Tex., is named in honor of First Lieut. Moss L. Love, Eleventh Cavalry, a native of Fairfax Courthouse, Va. Lieut. Love reported for aeronautical duty at Texas City, Tex., May 8, 1913, and was killed at San Diego, Cal., September 4, 1913.

Named for Lieut. Park

Park Field, Memphis (Millington), Tenn., is named in honor of First Lieut. Joseph D. Park, Fourteenth Cavalry, a native of the State of New Hampshire, and a graduate of the United States Military Academy. Lieut. Park reported for aeronautical duty at College Park, Md., and was killed near San Diego, Cal., May 9, 1912.

Post Field, Fort Sill, Okla., is named in honor of Second Lieut. Henry B. Post, Twenty-fifth Infantry. Lieut. Post reported for aeronautical duty at the Signal Corps Aviation School, San Diego, Cal., May 26, 1913. On December 18, 1913, he made an altitude record for the army, attaining a height of 10,5000 feet. On February 9, 1914, at San Diego, while attempting to make an American altitude record he was killed, having flown up 12,140 feet.

Rich Field, Waco, Tex., is named in honor of Second Lieut. Perry C. Rich, Philippine Scouts, who reported for aeronautical duty at Fort William McKinley, P. I., March, 1913, and was killed by a fall into Manila Bay November 13, 1913.

Rockwell Field, San Diego, Cal., is named in honor of Second Lieut. Lewis G. Rockwell, Tenth Infantry, who reported for aeronautical duty at College Park, Md., July 5, 1912, and was killed at that place September 28, 1912.

Death of Lieut. Selfridge

Selfridge Field, Mount Clemens, Mich is named in honor of First Lieut. Thomas Selfridge, Field Artillery, who was detailed for aeronautical duty in April, 1908. Previous to that time he had been assisting Prof. Alexander Graham Bell in his aeronautical experiments in Nova Scotia. On September 17, 1908, he was killed while flying as a passenger with Orville Wright at Fort Myer, Va.

Camp Taliaferro, Fort Worth, Tex., is named for First Lieut. Walter R. Taliaferro, who was detailed for aeronautical duty from the Infantry March 18, 1913. He held certificates as pilot, expert aviator, military aviator and junior military aviator. On September 17, 1915, he made an American duration record for pilot alone, remaining in the air nine hours and forty-eight minutes. He was killed at San Diego October 11, 1915.

Scott Field, Belleville, Ill., is named for Corpl. Scott, who was killed at College Park, Md., on September 28, 1912, while flying as a passenger.

Assignments

Capt. H. H. Sands, Aviation Section, O. R. C., to Hampton, Va.; Capt. R. C. Pierce, Aviation Section, to Fort Omaha, Nebraska.

The following officers, Aviation Section, will report to Mineola, N. Y.: First Lieuts. T. M. Ring, C. B. Stevens and MacCrea Stephenson.

Capt. T. L. Bailey and William Menkel, Aviation Section, to chief signal officer, Washington; First Lieut. B. B. Battle, Aviation Section., O. R. C., to Mineola, N. Y.

First Lieut. S. W. Ovitt, Aviation Section, O. R. C., to Fort Omaha, Nebraska.

Capt. W. J. Weir, Engineers, O. R. C., to Washington

First Lieut. G. L. Marburger, Aviation Section, O. R. C., to Toronto, Canada.

First Lieut. Adelbert Ames, Jr., Aviation Section, O. R. C., to Hampton, Va.

First Lieut. B. D. Franklin, Aviation Section, O. R. C., to Fort Wood, New York.

Captain Daniel M. Henry, Aviation Section, Signal Officers' Reserve Corps, to Washington, D. C., and report to Chief Signal Officer of the army.

First Lieutenant John F. Beecher, Aviation Section, Signal Officers' Reserve Corps, to Richmond, Va.

Captain James E. Stewart, Aviation Section, Signal Officers' Reserve Corps, to Mineola, Long Island, N. Y.

First Lieutenant C. Joseph Dexter, Aviation Section, Signal Officers' Reserve Corps, to active duty at Essington, Pa., and report to commanding officer, Signal Corps Aviation School.

First Lieutenant William T. Goldsborough, Aviation Section, Signal Officers' Reserve Corps, to active duty at South San Antonio, Texas.

First Lieutenant J. Caldwell Rochester, Aviation Section, Signal Corps, to Mineola, Long Island, N. Y.

First Lieutenant James H. Adoue, Aviation Section, Signal Officers' Reserve Corps, to active duty at Washington, D. C., and report to the Chief Signal Officer of the army.

First Lieutenant Theodore Arter, Aviation Section, Signal Officers' Reserve Corps, to active duty at Hampton, Va.

First Lieutenant Christopher O. Anderson, Aviation Section, Signal Officers' Reserve Corps, to active duty at Mineola, Long Island, N. Y.

Folowing named officers, Aviation Section, Signal Officers' Reserve Corps, to active duty at Fort Omaha, Neb., Army Balloon School: First Lieutenants James Arthur Christie and James P. Haight.

First Lieutenant Harry L. Wheeler, Signal Corps, will report to commanding officer, Langley Field, Hampton, Va., for duty.

Major Arthur R. Christie, junior military aviator, Signal Corps, to Washington, D. C., and report to Chief Signal Officer of the Army for temporary duty.

Following named officers, Aviation Section, Signal Officers' Reserve Corps, to South San Antonio, Texas: Captain Julian C. Smith and First Lieutenants Arthur W. Betts and John F. O'Rourke.

Student Aviator Held as Enemy of America

San Diego, Cal.—Joseph Van Diviucet, student aviator at North Island Aviation Station, is a prisoner in the county jail as an alien enemy. He was arrested by United States Marshal Carse on a Presidential warrant.

Aviation Officers

First Lieut. H. C. Colburn, Av. Sec., S. R. C., to duty Mineola, N .Y. (Oct. 1, War D.)

Officers of Av. Sec., S. R. C., to duty as follows: Major W. A. Burbank to Fort Worth, Texas, Taliaferro Field; Capt. A. L. Loening to Mineola, N. Y., Hazelhurst Field, for temporary duty, Oct. 15, 1917, and will proceed to Dallas, Texas, Love Field, not later than Oct. 27, 1917; Capt. J. S. Foster to Waco, Texas. (Oct 2, War D.)

First lieutenants of Av. Sec., S. R. C., to duty as follows: E. Buford, Jr., and J. A. King to Hazelhurst Field, Mineola, N. Y.; W. A. Fleming to Cambridge, Mass., School of Military Aeronautics, Mass. Institute of Tech.; C. Rhodes to Hazelhurst Field, Mineola, N. Y.; M. W. Wickersham to Selfridge Field, Mount Clemens, Mich.; L. H. Lee, Call Field, Wichita Falls, Texas; R. F. Jones to Mineola, N. Y.; C. Tiffany, Selfridge Field, Mount Clemens, Mich. (Oct. 2, War D.)

First lieutenants Av. Sec., S. R. C., to duty Army Balloon School, Fort Omaha: M. R.



One of the factories of the Whitehead Aircraft Co., at Surrey, England

Smith, B. M. Clark, R. L. Sparks. (Oct 2, War D.)

First lieutenants Av. Sec. S. R. C., to duty Mineola, N. Y.: W. C. Hammond, J. R. Graham, R. B. Harper, J. H. Zoerman, R. B. Quick, H. L. Fontaine. (Oct. 2, War D.)

First lieutenants, Av. Sec. S. R. C., to duty Mineola, N. Y.: A. B. Patterson, A. H. McLanahan, S. E. McKeown, T. F. Lennon. (Oct. 2, War D.)

Par. 85, S. O. 223, Sept. 25, 1917, War D., is amended so as to rate Major H. B. Hersey, Av. Sec., S. R. C., as a junior military aeronaut instead of a junior military aviator. (Oct. 2. War D.)

Officers of Av. Sec., S. R. C., to duty as follows: Capt. A. L. Lavine to Washington, D. C.; Capt. J. H. Alden, to C. S. O. of Army; Capt. T. A. Grant to Mineola, N. Y.; Capt. C. C. Ames to Fort Sam Houston, Texas; 1st Lieut. H. Imbrie to Call Field, Wichita Falls, Texas; 1st Lieut. F. L. Baxter to C. S. O. of Army; 1st Lieut. K. W. Todd to Mount Clemens, Mich.; 1st Lieut. J. N. Patterson to Washington; 1st Lieuts. W. J. Reed and R. W. Thompson to Army Balloon School, Fort Omaha; 1st Lieut. F. A. Dickman to Selfridge Field, Mount Clemens, Mich.; 1st Lieut. L. P. Ordway, Jr., to Morison, Va., concentration camp; 1st Lieut. A. H. Fraser to Camp Kelly, South San Antonio, Texas; 1st Lieut. F. O. Replogle to Middletown, Pa.; 1st Lieuts. B. J. Gaylord and L. H. Richards to Mineola, N. Y. (Oct. 3, War D.)

First lieutenants, Av. Sec., S. R. C., to duty at Mineola, N. Y.: A. Mitchell, T. C. Taylor and A. McAleenan, Jr. (Oct. 3, War D.)

First lieutenants, Av. Sec., S. R. C., to Mineola, N. Y., for duty; H. B. Vanderhoef, Jr., O. Melamet, O. M. Gravatt, C. A. Brodie and St. C. Street. (Oct. 3, War D.)

First lieutenants, Av. Sec., S. R. C., to Mineola, N. Y., for duty: M. Mellen, H. A. Miller and H. M. Guilbert. (Oct 3, War D.)

Officers of Av. Sec., S. R. C., to duty as follows; Capt. J. F. Pourron to Millington, Tenn., Park Field; Capt. G. Reed to Dallas, Texas; Capt. R. S. Rainsford to Governors Island, N. Y.; Capt. A. D. Smith to Park Field, Millington, Tenn., Oct. 27, 1917, Signal Corps Aviation School; Capt. P. H. Jennings to Washington; Capt. G. R. Wadsworth to Philadelphia, Pa., for duty at the naval aircraft factory, U. S. navy yard; 1st Lieut. H. W. Lake to Dallas, Texas; 1st Lieut. C. D. Weatherby to Fairfield, Ohio; 1st Lieut. F. M. Murphy to Capt. A. B. Lambert, Sig. Corps, Missouri Aeronautical Society, St. Louis, Mo.; 1st Lieut. W. A. Fox to Washington; 1st Lieut. W. R. Gehan to Millington, Tenn., Oct. 27, 1917, Signal Corps Aviation School, Park Field; 1st Lieut. W. K. Norton to Hazelhurst Field, Mineola, Long Island, N. Y. (Oct. 3, War D.)

Officers of Av. Sec., S. R. C., to duty as follows: Capt. D. M. Henry to Washington; 1st Lieut. W. A. Thompson to Mineola, N. Y.; 1st Lieut. W. H. Warren to Middeltown, Pa.; 1st Lieut. G. Perkins to Mineola, N. Y. (Oct. 4, War D.)

Aviation Section

Lieut. Col. J. C. Morrow and Major D. B. Netherwood, Jr. Mil. Av. S. C., are rated as military aviators from July 23, 1917, and Aug. 20, 1917, respectively. (Oct. 2, War D.)

Major D. B. Netherwood, Jr. Mil. Av. S. C., to Love Field, Dallas, Texas, and assume command of the Signal Corps Aviation School not later than Oct. 27. (Oct. 2, War D.)

Major R. B. Barnitz, Jr. Mil. Av. S. C., to Dallas, Texas, Love Field, for duty. (Oct 3, War D.)

Extracts From S. O. 233 & 234

Major Norman H. Reed, Major Harold E. Hartney, Major Cecil A. Bourne, to report Senior Officer, Signal Corps personnel, Camp Borden, Ontario, Canada, for duty.

First Lieut. Thomas F. Ward, Av. Sec., S. O. R. C., on duty requiring him to participate regularly and frequently in aerial flights from Sept. 25th, 1917.

Orders assigning Capt. John F. Pourron, Av. Sec., S. O. R. C., to duty Park Field, Millington, Tenn., amended to read Capt. Joseph F. Pourron.

Capt. William L. Patterson, Signal Corps, to Langley Field, Hampton, Va., for duty.

Capt. Harry R. Vaughan, Av. Sec., Signal Corps, rated Junior Military Aeronaut, from July 24th, 1917.

Major Budd D. Gray, Signal Corps, to Chief Signal Officer of the Army, for duty.

First Lieut. John W. Davis, Av. Sec., S. O. R. C., active duty at School of Military Aeronautics, University of Illinois, Urbana, Illinois.

First Lieuts. Thomas M. Ring, Carlos B. Stevens, McCrea Stephenson, to active duty Hazelhurst Field, Mineola, Long Island, New York.

Major David H. Bower, Signal Corps, rated Junior Military Aeronaut, from July 24th, 1917.

Capts. Theodore L. Bailey, and William Menkel, Av. Sec., S. O. R. C., active duty reporting to the Chief Signal Officer of the Army for assignment.

First Lieut. Blanchard B. Battle, Av. Sec., S. O. R. C., active duty Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Adelbert Ames, Jr., Av. Sec., S. O. R. C., to Langley Field, Hampton, Virginia.

First Lieut. Beufurd D. Franklin, Av. Sec., S. O. R. C., active duty at Fort Wood, New York.

First Lieut. Spalding W. Ovitt, Av. Sec., S. O. R. C., active duty at Army Balloon School, Fort Omaha, Nebraska.

First Lieut. George L. Marburger, Av. Sec., S. O. R. C., active duty with detachment, Aviation Section, Signal Corps, Toronto, Canada.

The following named officers, S. O. R. C., from duty at Signal Corps Training Camp, Leon Springs, Texas, to Camp Gordon, Atlanta, Ga., 82nd Div. 307th Field Signal Battalion: Capt. Terry W. Allen, First Lieuts. Harold W. Peters, Victor H. Laughter, and Glenn S. Matthews.

Capt. Henry H. Sands, Av. Sec., S. O. R. C., to Langley Field, Hampton, Virginia.

Capt. Raymond C. Pierce, Av. Sec., S. O. R. C., to Army Balloon School, Fort Omaha, Nebraska.

First Lieut. Dorr K. Taylor, Av. Sec., S. O. R. C., to duty Signal Corps General Supply Depot, Middletown, Pennsylvania.

Capt. Frederick L. Wells, Av. Sec., S. O. R. C., active duty and detailed member board of officers, vice Capt. Fred Sydel, Signal Corps relieved.

First Lieuts. Edward A. Stoner and Charles L. Gustafson, Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York.

Extracts From Special Order 234

Capt. Albert D. Smith, Av. Sec., S. O. R. C., to report for examination to determine his qualifications as Junior Military Aviator.

First Lieut. A. Wallace Gibson, Av. Sec., S. O. R. C., to duty at Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Nathan B. Forrest, S. O. R. C., from Signal Corps Training Camp, Fort Leavenworth, Kansas, to 89th Div., Camp Funston, Fort Riley, Kansas, duty with 314th Field Signal Battalion.

First Lieut. John Dentworth, Av. Sec., S. O. R. C., on duty requiring aerial flights from September 22nd, 1917.

Major Wm. H. Wilmer and Capt. Edward G. Seibert, Medical Reserve Corps, from Washington, D. C., to Mineola, Long Island, New York, temporary duty with Aviation Service in the Army.

Major Maxwell C. Kirby, junior military aviator, Signal Corps, to the Chief Signal Officer of the army for duty.

First Lieut. John H. Jouett, Signal Corps, is rated as a junior military aviator, from July 24, 1917.

First Lieut. Harold C Whiteside, Av. Sec. S. O. R. C., to active duty and will proceed to Mineola, Long Island, N. Y., reporting to the commanding officer, Hazelhurst Field, for assignment to duty.

First Lieut. Conor Coppinger, Signal Corps, report to the Chief Signal Officer of the army for duty.

First Lieut. William A. Campbell, Signal Corps, reporting to the commanding officer, Signal Corps Concentration Camp, Morrison, Va., for duty.

Paragraph 62, Special Orders No. 220, War Department, Sept. 21, 1917, relating to Capt. George F. Kearney, Av. Sec., S. O. R. C, is revoked.

First Lieut. James F. Hudson, S. O. R. C., from Signal Corps Trainnig Camp, Fort Leavenworth, Kan., to Camp Grant, Rockford, Ill., reporting in person to the commanding general, 86th Division, for assignment to duty with the 311th Field Signal Battalion.

Capt. Murray B. Dilley, S. O. R. C., to proceed via Little Silver, N. J., to Burlington, Vt., for duty as instructor at the University of Vermont with work of the Signal Corps, relieving First Lieut. Ernest J. Wessen, S. O. R. C., who will report to the Chief Signal Officer of the army for duty.

The following named officers of the Signal Corps will proceed to Mineola, Long Island, N. Y., reporting in person to the commanding officer, Hazelhurst Field, for duty: First Lieut. Nathaniel M. Larner, First Lieut. William G. Morrow, First Lieut. Harvey B. Ramage, First Lieut. Walter M. Pegram, First Lieut. Leo Smith, First Lieut Frederick Bowne, Jr., First Lieut. Alex. L. Garred, First Lieut. C. E. Grevemberg.

The resignation of First Lieut. Runa W. Martin, Signal Officers' Reserve Corps, is accepted by the President from October 8, 1917.

First Lieut. Calvin H. Burkhead, S. O. R. C., from duty at Camp Alfred Vail, Little Silver,



One of the latest Nieuport biplanes, a favorite amongst the members of the Lafayette Escadrille

N. J., to Camp Meade, Annapolis Junction, Md., reporting in person to the commanding general, 79th Division, for duty with the 304th Field Signal Battalion.

The following named officers, Av. Sec., S. O. R. C., active duty, reporting to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty. First Lieut. Arthur R. Curphey, First Lieut. Alexander McLeod, First Lieut. Bedford E. Armstrong, First Lieut. Lucas Proudfit, First Lieut. Richard C. M. Page, First Lieut James W. Osgood, First Lieut. William M. Conant, Jr., First Lieut. Fletcher L. McCordic, First Lieut. Garland S Taylot, First Lieut. Frank S. Soule.

Capt. Charles A. Culver, S. O. R. C., relieved from duty, proceed to Washington, D. C., reporting to the Chief Signal Officer of the army for duty.

By the direction of the President, First Lieut. George G. Evans, S. O. R. C., is honorably discharged from the service of the United States, to take effect October 8, 1917, his services being no longer required.

The resignation of First Lieut. Fred J. Payson, S. O. R. C., is accepted by the President, to take effect October 8, 1917.

First Lieut. Clarence E. Andrews, Av. Sec., S. O. R. C., active duty, reporting to the Chief Signal Officer of the army for duty.

The following named officers of the Medical Reserve Corps are relieved from duty with the aero squadron at Fort Wood, New York, and will proceed to Mineola, Long Island, N. Y., reporting in person to the commanding officer, Signal Corps, Av. School, Hazelhurst Field, that place for duty and by letter to the commanding general, Av. Sec., Signal Corps, United States Army, 119 D Street, N. E., Washington, D. C.: First Lieut. Foster A. Beck, First Lieut. Clyde O. Brown, First Lieut. Ralph C. Christie, First Lieut. James E. Dull, First Lieut. Scott R. Fisher, First Lieut. Claude V. Gautier, First Lieut. James L. Pennington.

First Lieut. John H. McCawley, Av. Sec., S. O. R. C., active duty, reporting to the commanding officer, Army Balloon School, Fort Omaha, Nebraska, for duty.

First Lieut. Thomas E. P. Rice, Av. Sec., S. O. R. C., active duty, reporting to the commanding officer, Chandler Field, Essington, Pa., for duty.

First Lieut. Edward Sampson, Av. Sec., S. O. R. C., active duty, reporting to the commanding officer, School of Military Aeronautics, Princeton, N. J., for duty.

First Lieut. Roy R. Showalter, Av. Sec., S. O. R. C., active duty, reporting to the commanding officer, Chanute Field, Rantoul. Ill., for assignment to duty.

Major Roycroft Walsh, Signal Corps, proceed to San Antonio, Tex., reporting to the commanding officer, Camp Kelly, for duty.

First Lieut. Robert G. Woodcock, Signal Corps, proceed to Washington, D. C., reporting to the Chief Signal Officer of the army for duty.

First Lieut. Frederic Nickerson, Signal Corps, proceed to Mineola, Long Island, N. Y., reporting to the commanding officer in person, Hazelhurst Field, for duty.

The order heretofore issued relieving First Lieut. Clarence G. Spencer, Av. Sec., S. O. K. C., from his present duties and directing him to Washington, D. C., and reporting in person to the Chief Signal Officer for temporary duty in connection with the aviation section of the army is revoked.

Capt. James E. Stewart, Av. Sec., S. O. R. C., proceed to Mineola, Long Island, N. Y., reporting in person to the commanding officer, Hazelhurst Field, for assignment to duty.

First Lieut. Edward A. Hanske, Av. Sec., S. O. R. C., active duty and reporting to the commanding officer, Army Balloon School, Fort Omaha, Nebraska, for duty.

Capt. Henry H. Sands, Av. Sec., S. O. R. C., relieved from duty at Mount Clemens, Michigan, proceed to Hampton, Va., reporting in person to the commanding officer, Langley Field, for duty.



A Sopwith scout, built by the Whitehead Aircraft Co., of England

First Lieuts. John J. Lancer and Milton R. Walter, Medical Reserve Corps, are relieved from duty at the medical officers' training camp, Fort Benjamin, Harrison, Ind., proceeding to Fort Wayne, Mich., reporting in person to the commanding officer, recruiting depot, Av. Sec., Signal Corps, for duty and by letter to the commanding general, Av. Sec., Signal Corps, Washington, D. C.

Extracts From Special Orders 241.

Officers, S. O. R. C., from duty Signal Corps Training Camp, Ft. Leavenworth, Kansas, to Camp Gordon, Atlanta, Georgia, reporting as indicated to commanding general, 82d Division, for assignment with 307th Field Signal Battalion: Capt. Kilberth D. Shaffer, Company B. First Lieut. Calyborne A. Arthur, Adj., and supply officer; First Lieut. Alfred Thomas, Jr., to Company A., First Lieut. Clarence G. Shriver, to Company B; First Lieut. Delman O. Hood, to Company C., First Lieut. William T. Busch, to Company C.

First Lieut. Henry Corse, Jr., Signal Corps, proceeding to Mineola, Long Island, New York, reporting to the commanding officer in person, Hazelhurst Field, for duty.

First Lieut. Wilfred G. Threader, Aviation Section, S. O. R. C., to active duty, reporting to the commanding officer, Wilbur Wright Field, Fairfield, Ohio for duty.

First Lieuts. Charles Conrad and William W. Crehore, Jr., Aviation Section, S. O. R. C., to active duty, reporting to the commanding officer, Post Field, Fort Sill, Oklahoma, for duty.

First Lieut. Edwin V. Dougherty, Aviation Section, S. O. R. C., to active duty, reporting in person to the commanding officer, Selfridge Field, Mount Clemens, Michigan, for duty.

Capt. Charles B. Hazeltine, Signal Corps, relieved from duty, proceeding to Anniston, Alabama, reporting to the commanding officer, 29th Division, Camp McClellan, for duty as commanding officer of the 104th Field Battalion.

Capt. William J. Spencer, Aviation Section, S. O. R. C., to active duty, proceeding to Austin, Texas, reporting to the commanding officer, School of Military Aeronautics, University of Texas, for duty.

First. Lieut. Donald G. Barnhouse, Aviation Section, S. O. R. C., to active duty, reporting to the commanding officer, School of Military Aeronautics. Princeton University, Princeton, New Jersey, for duty.

First Lieut. William D. O'Gorman, Signal Corps, will report in person to the Chief Signal Officer of the Army, for assignment to duty.

First Lieuts. Stuart W. Kellogg and Daniel E. Kennedy, Aviation Section, S. O. R. C., to active duty, reporting to the commanding officer in person, Army Balloon School, Fort Omaha, Nebraska, for assignment to duty.

Capts. Dean Smith and Wilbur C. Dodd, Aviation Section, S. O. R. C., are announced as on duty requiring them to participate regularly and frequently in aerial flights from October 1, 1917.

Capt. Harral Mulliken, Aviation Section, S. O. R. C., proceed to Ithaca, N. Y., reporting to the commanding officer, School of Military Aeronautics, Cornell University, for assignment to duty.

First Lieut. W. Frank Bull, Aviation Section, S. O. R. C., is detailed as a member of the board of officers appointed by paragraph 27, special orders 132, War Department, June 8, 1917, to meet at Ithaca, N. Y., for the purpose of examining applications for commission in the Aviation Section, Signal Officers' Reserve Corps, vice Major Howard C. Davidson, junior military aviator, Signal Corps hereby relieved.

So much of paragraph 44, Special Orders 229, War Department, October 2, 1917, as related to First Lieut. Reuben B. Harper, Aviation Section, S. O. R. C., is amended to read First Lieut. Reuben H. Harper.

Capt. Arthur B. Sperry, Signal Officers' Reserve Corps, relieved from duty at Camp Alfred Vail, Little Silver, N. J., proceeding to Camp Meade, Annapolis Junction, Maryland, reporting in person to the commanding General 79th Division, for assignment to duty with the 304th Field Signal Battalion.

A board of officers to consist of: Capt. Alfred W. Tozzer, Aviation Section, S. O. R. C., and Capt. Robert Levy, Medical Reserve Corps, is appointed to meet at Denver, Colorado, for the purpose of examining applicants for commission in the Aviation Section, S. O. R. C.

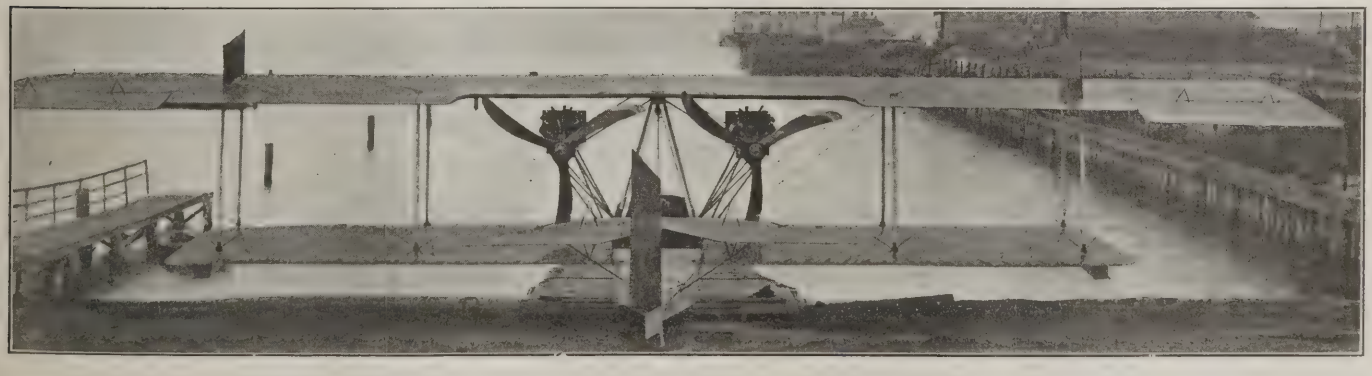
Extracts From S. O. 240.

First Lieut. J. Brooks, B. Parker, Av. Sec. S. O. R. C., to active duty, reporting to the Chief Signal Officer of the Army for assignment.

Paragraph 140, S. O. 231, Oct. 4, 1917, relating to First Lieut. Robert L. Taylor, Jr., S. O. R. C., amended to read First Lieut. Richard L. Taylor, S. O. R. C.,

Paragraph 13, S O. 223, Sept. 25th, 1917, relating to Major George R. Robertson, Av. Sec. Signal Corps, amended to read Major

(*Continued on page 298*)



A rear view of the Maryland Aeroplane Company's Twin E. N. V. motored flying boat, which was described in our issue of June 18th

THE HANSA-BRANDENBURG TRACTOR

OF the aircraft captured by the Italians, the Austrian Hansa-Brandenburg machine is regarded as one of the most important and interesting, and a number of details of authentic measurements of this machine have recently been obtained. The chief designer of Hansa & Brandenburgische Flugzeugwerke is Engineer Director Hunkel, formerly of the Albatros firm. The Hansa-Brandenburg Aircraft Co., is one of the three main suppliers of German seaplanes.

The struts staggered outward at their lower ends is a feature peculiar to this machine. Many of the Albatros features are seen in this machine, together with a number of original and unique fittings. The accompanying drawings show a side and front view and a plan view from below. A metric scale is given, as all the measurements are referred to in millimeters. A handy reference for converting the figures to feet and inches will be found in an article published last week in AERIAL AGE, on page 244.

General Dimensions

Span, upper plane	12,240 mm
Span, lower plane	11,720 mm
Chord, both planes	1,713 mm
Area, upper plane	2,770 sq. meters.
Area, lower plane	1,790 sq. meters.
Gap between planes	1,713 mm
Overall height	3,142 mm
Overall length	8,370 mm
Motor, Warskalowski	200 H.P.

Planes

Planes are in four sections—two upper and two lower. Upper plane sections joined at the top of a cabane formed of steel tube 30 by 40 mm, with lower ends terminating in fittings attached to the upper longerons of the fuselage.

Each upper plane section has an area of 1,135 sq. meters. Each lower plane section has an area of 895 sq. meters.

Ailerons are attached to subsidiary steel tube spars to the rear of the main wing beams. Attachment is made with a fitting of sheet metal and soft wood blocks, with fiber to take up the wear. Each aileron has five such hinges. Ailerons each 2,850 mm long.

Wing beams are cut in two vertically, hollowed for lightness and mortised together with hardwood strips. Forward spar varies from 70 to 72 mm in height and the rear spar the opposite; both are 35 mm thick.

Entering edge is curved to a diameter of 40 mm. Front spar centered 100 mm from leading edge. Wing spars 800 mm apart.

Battens are 2.5 thick and 13 mm wide. Webs 45 mm thick, cut away for lightness to within 15 mm of the battens. Light veneer strips 12 mm wide, reinforce the webs between lightening holes.

The interplane struts are of 32 mm diameter steel tube with their ends terminating in eyes for attachment to the strut sockets. Hollow wood fairing strips are bound to the rear of the strut tubing, giving it a streamline form, and bringing its width to 126 mm. Each end is attached by an 8 mm bolt. Lift, landing and incidence cables vary from 5 to 7 mm in diameter.

Fuselage

Overall width of fuselage, 1,020 mm. From the forward engine plate to the rudder, the fuselage is 7,180 mm long. A formed cap fits over the forward engine plate, and the propeller shaft goes through it. Four sheet metal engine plates carry the two 50 by 100 mm engine bed rails. The longerons are solid, 30 by 45 mm at the front, the lower pair tapering to 19 mm square and the upper pair 17 mm square.

The pilot's seat is set in a recess formed at the top of the main fuel tank. Overall dimensions of the tank—top 500 by 820 mm; bottom 700 by 820 mm; height 650 mm. The back forms a right angle with the top and bottom and the forward end slopes down from the top. A recess 170 mm deep, 700 mm long and 470 mm wide is provided for the seat. Seat 350 mm long and 440 mm wide, resting on a pair of iron bands 75 mm thick and 34 mm wide, which encircle the tank. A filling tube runs up at the rear of the tank, near the side, with a 54 mm opening.

A fixed machine gun is provided for the pilot, located on the upper plane. The gunner's cockpit, at the rear, is provided with a movable machine gun clamped to a rail around the cockpit opening.

Tail Group

The horizontal stabilizer is in one piece, resting on the upper longerons. The forward end is rounded off at a 400 mm radius. Overall dimensions, 2,290 by 2,940 mm. Surface at each side of body, 192 square meters. The edges are of steel tube 20 mm in diameter and the internal structure is of 10 mm diameter tube. It is supported from below by a pair of steel tubes of 25 by 13.5 mm section. Threaded eyes in the lower ends allow of their adjustment. Lower ends attach to lower longerons at a point 1,860 mm from the fuselage termination.

Slots, 600 mm apart, are provided where the flap control cables run through the stabilizer.

From tip to tip the elevator flaps measures 3,500 mm. Maximum width, 670 mm. Each flap has an area of 83 square meters. Edges are formed of 15 mm tube, and outer tips curved to a 120 mm radius.

Flap hinges are of sheet metal, soldered to the 25 mm tube of the flap and stabilizer. Fiber blocks between the tubes space them 10 mm apart, and take the friction of the flap movement.

The vertical fin is triangular, 700 mm high and 1,300 mm wide. The rudder is 1,650 in overall height. Width at rear of pivot, 670 and width forward of pivot (the balanced portion) 340 mm. Forward edges curved to a 30 mm radius, and trailing end to a 110 mm radius. Two hinges attach the rudder to the fin. The control lever is of solid steel, and it spaces the control wires 117 mm apart.

Landing Gear

The axle is of steel tube, 54 mm outside diameter, 46 mm inside, located at a point 1,680 mm from the front of propeller hub. Landing wheels are 770 mm in diameter by 100 mm wide, and centered 2,070 mm apart. Two sections of streamline fairing are bound to the axle, and a claw brake between them.

The brake is 730 mm long; 230 mm forward of the axle and 500 mm to the rear. The claw is 145 mm in length, and the brake is operated by a cord from the pilot's seat.

The chassis struts are of 70 by 35 mm tube. The forward pair is faired with streamlining to a total depth of 120 mm. A peg is located half way up both of these struts as a means of mounting to reach the motor. At the lower end of chassis struts, the shock absorbing elastic cords are bound. Grooves keep them in place and a leather strap, strung from forward to rear struts, limits the upward movement of the axle.



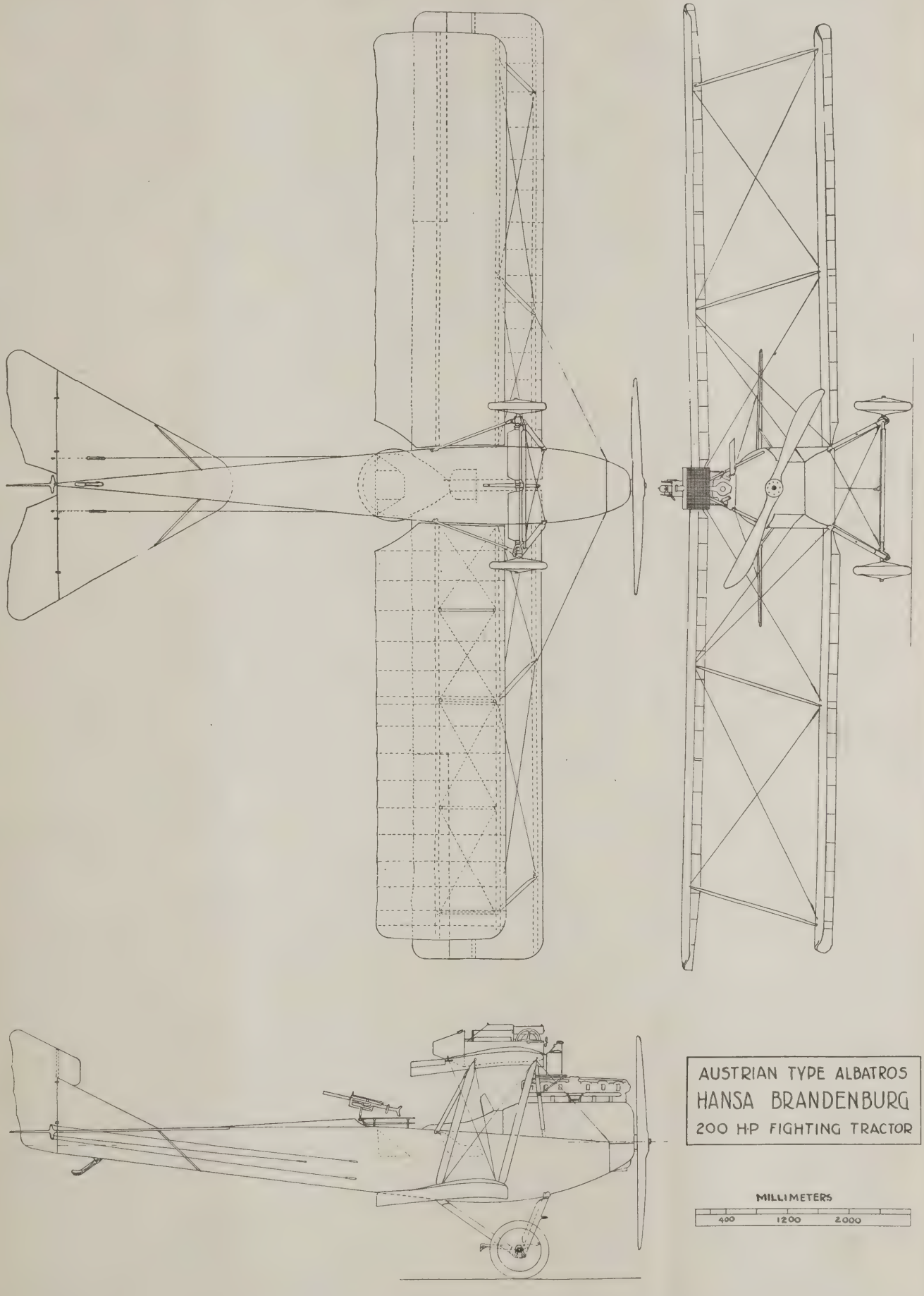
A German machine of the Albatros type, of which the Austrian Hansa-Branbenburg is a late development

The tail skid is of bevelled ash, 38 by 53 mm, universally mounted on a swivel at the lower end of a central fuselage tube which is 28 mm in outside diameter and 24 mm inside. Inside the body another 28 mm tube runs from the bottom to the top of fuselage, parallel with the skid, and at its upper end the skid is bound by four solid rubber rings, prevented from slipping by a 4 by 20 mm leather strap attached to the skid by screws. The lower end of the skid is metal shod, and an additional V section metal piece comes in contact with the ground.

Motor Group

The motor is a Warskalowski water-cooled 6-cylinder vertical motor, rated at 200 H.P. The propeller is 2,800 mm in diameter, centered 1,802 mm above the ground line when its axis is horizontal.

The small auxiliary or service tank is located aft of the machine gun, resting on the upper plane. The radiator is mounted above the motor, just forward of the upper plane, supported from the cabane by a pair of brackets. The radiator has a cooling face of 520 mm width and 300 mm height; depth, 200 mm. The water space is 45 mm higher than the face, curved to a semi-streamline. The filler is 78 mm above the water space and has a 65 mm diameter opening.


AUSTRIAN TYPE ALBATROS
HANSA BRANDENBURG
200 H.P. FIGHTING TRACTOR
MILLIMETERS
400
1200
2000
McLaughlin

THE METALLURGY OF CAST IRON AEROPLANE ENGINE CYLINDERS

By F. W. Adams, M. Sc.

IN the making of a complete aeroplane probably the most vital part in the construction is the engine. In order to obtain maximum efficiency, combined with strength and lightness, the designs of these types of engine have become exceedingly complicated. Parts of the aeroplane engine on which its efficiency largely depends, and which have to take most of the work, are the cylinders, which, up to the present, in the majority of British-made air-cooled engines of the stationary type, have been made of cast iron. The designs of these cylinders have been worked down to such fine limits that it requires very considerable skill on the part of the iron-founder to produce a sound casting, fulfilling accurately the demands of Government specifications.

In the following paragraphs the author will endeavor to show, from a metallurgical standpoint, how the mixtures and processes are regulated in order to give the best results, and also put forward the reasons which, in his opinion, may account for some of the failures experienced in foundry practice. In order that some of these practical difficulties may be realized better by the layman it will perhaps be instructive to state the chief details of the specifications to which makers of this type of cylinder must rigidly adhere, so that the cylinder, after being machined, may pass the critical examination of the A. I. D. inspector. These tests may be summed up briefly as follows:

Chemical analysis.
Porosity or water pressure test.
Size limits.

The percentage of the constituent elements of the iron are specified, and allow of little variation, since the tensile strength, porosity, and shrinkage depend almost entirely on a correct mixture being maintained. A mixture is aimed at which will give a cylinder sufficiently hard to ensure a reasonable life, but which at the same time is machinable and not porous. The structure of the type of iron most suitable for this purpose is best understood by comparing photo-micrographs 1, 2 and 3. All of these are unetched, and are under the same magnification of approximately 150 diameters.

No. 1 is a piece of grey hematite cast iron. This shows the graphite (the dark patches) distributed in large curved flakes. The brittleness and weakness of grey cast iron are due very largely to the presence of these large graphite plates.

No. 2 shows the structure of a white iron in which, it will be observed, no graphite exists. This type, although very hard, is too brittle to be of any service, since all the carbon is present in the iron in the combined form.

No. 3 shows the typical structure of a cylinder iron which has given excellent results. In this specimen it will be seen that the graphite is well and uniformly distributed in small flakes throughout the metal.

No. 4 is the same iron as No. 3, but etched with nitric acid to show the portions of the iron containing carbon in the combined form. In this photo-micrograph the dark portions are the graphite and the half-tones the pearlite; that is, the portions containing the combined carbon.

From the above it will be seen that the object to be attained is to adjust the proportions of graphite carbon, which renders the iron machinable, and also exerts a lubricating effect to combined carbon which gives strength and wearing surface to the cylinder. The importance of this will be realized on considering what excessive wear the cylinder experiences in actual service, and how short its life would be if these relative proportions are not maintained. In connection with this it might be advantageous for cylinder makers to conduct experiments with suitable metals—*e. g.*, nickel, titanium, etc.—with the view of producing more serviceable alloys. Unfortunately the price of these metals has up to the present rendered their use prohibitive.

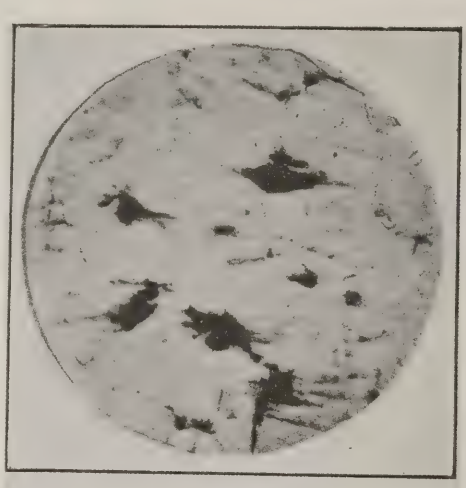


Fig. 1.

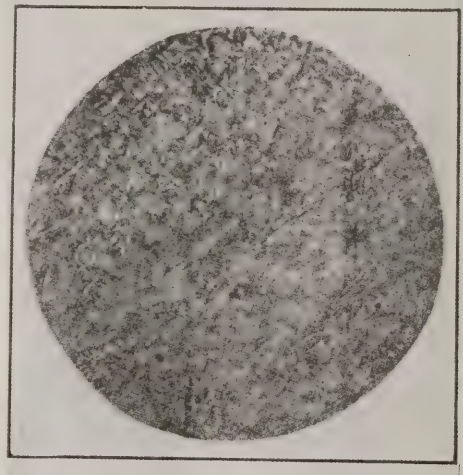


Fig. 2.

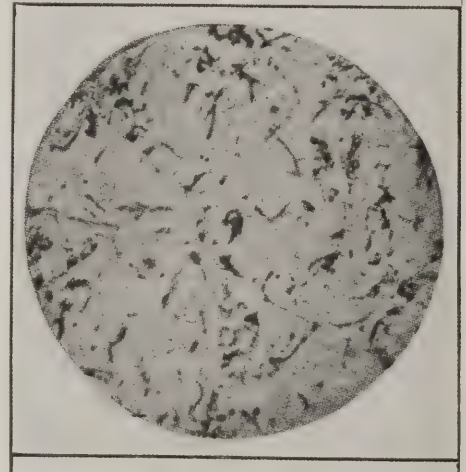


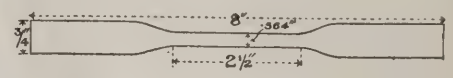
Fig. 3.

Among the elements contained in cast iron, those exerting the greatest effect on the condition of the carbon are silicon and manganese. The former tends to precipitate graphite, while the latter forms a carbide which tends to retain the carbon in the combined form in the iron.

The composition of the mixture is calculated from the analysis of the pig irons available, and, in order that the final metal shall be of a correct composition, due regard must be taken both of the amount of silicon and manganese eliminated in melting, and also of the increase of carbon absorbed by the molten iron, from the coke used to melt the charge. In melting the time factor must also be taken into account. Owing to the thinness of the casting, phosphorus must be relatively high in order to promote fluidity and enable the metal to take the finest parts of the mould. This element produces in the iron decided brittleness under shock, and so excess must be carefully avoided.

Fluidity, of course, can be produced by a high melting temperature, but this has several disadvantages, since not only is more carbon absorbed by the molten metal, but also rapid cooling, on casting, takes place at critical temperatures, resulting in brittleness and hard patches in the finished casting. These hard patches cause considerable trouble in machining, and can only be removed by careful annealing—an operation which requires a careful regulation of temperature to analysis, and if not carefully carried out may lead to distortion and porosity.

The tensile strength of cylinder iron varies from ten to twenty tons per square inch. The test is usually carried out on bars cast from the same ladleful of metal as the batch of cylinders. The bars are of the shape and dimensions shown below.



These bars are not machined, but are pulled in the rough with the outside skin left on. The elements controlling the strength of the metal are phosphorus, manganese, silicon and carbon.

The limits of phosphorus are fixed by the analysis specification, and must not be exceeded if good tests are to be obtained, and with careful working the phosphorus percentage can be kept well within these limits. Manganese up to 0.8% apparently adds to the ultimate tensile strength of the iron, but if increased beyond this limit seems to exert a similar effect on the cast iron to that observed in high carbon steels; that is, it produces hardness and brittleness. The action of silicon is to precipitate graphite, which, as previously pointed out, when in excess renders the iron weak. The effect of casting temperatures on the condition of the carbon in the iron has already been dealt with in the previous section.

The water pressure test is probably the most exacting test to which aeroplane

cylinders are subjected. Frequently finished cylinders which have passed all previous tests satisfactorily are rejected for porosity under this final examination. The machined cylinders are tested up to a water pressure of 500 lb. per square inch, and at this pressure must not show the slightest trace of leakage or even dampness on the outside surface. The severity of this test will be realized when recently it was stated by an American foundry authority that a water pressure test of 100 lb. per square inch was considered adequate for motor cylinders. From investigations of failures it has been concluded that porosity may be due either to excessive graphitic carbon or to "blowholes." Dealing with the first of these causes of failure, it will be instructive to compare the size of the graphite flakes in the photo-micrograph (No. 3) of the standard cylinder iron with those contained in the photo-micrograph (No. 5) of a cylinder iron which failed under water pressure test (photo-micrograph 5). In this case there were no actual leaks, but merely a suspicion of dampness on the outside of the casting. This slight leakage usually occurs in the thinner portions of the cylinder, and is apparently due to lack of adhesion between the graphite plates and the metal itself when subjected to this high pressure. This excess of graphite in the iron may be due to incorrect casting temperature, to excess of silicon, or to a combination of both. If the percentage of silicon in the metal is too high, the temperature of casting may be varied within comparatively wide limits, and yet the size and amount of graphite in the resulting casting is excessive.

A high melting temperature almost invariably means a high absorption of carbon from the fuel by the molten iron. If the metal is cast at this high temperature, as cooling takes place any excess of carbon over that which can be retained in the combined form in the iron will be precipitated as graphite. This effect is, of course, increased by the presence of silicon. Definite leaks appear to be caused by actual defects in metal, such, for instance, as particles of sand, entrapped gas, and weak places due to liquid contraction. These are usually included under the general term "blowholes." Sand and rubbish may occur in a casting from bad moulding. If the sharper portions of the mould have not been made sufficiently firm, when the metal is poured in, particles of sand are swilled off and retained in the metal on solidification. Low temperature casting may also cause this defect, since, if the metal is not sufficiently fluid, any admixed slag or *débris* cannot rise to the top of the ladle, and efficient skimming is thereby rendered impossible.

The gases usually produced in the mould during casting and which frequently ignite and burn with a blue flame outside the mould are carbon monoxide and hydrogen. If the mould is not quite dry steam is generated when the molten metal is poured in. Contact with the red-hot iron decomposes the steam into oxygen and hydrogen, the former uniting with carbon to produce carbon monoxide. If the mould is provided with a sufficient number of vents and the cores are reasonably porous these gases will readily escape. Should, however, the iron be cast too cold, solidification takes place too rapidly to allow all this gas to escape, and varying quantities of it become entrapped in the solid metal, and thus give rise to cavities in the casting. It is most difficult to avoid weakness produced by liquid contraction in the castings, which vary considerably in thickness. This will perhaps be better understood by considering what takes place as soon as a cylinder is cast. The thinner portions, of course, cool very rapidly, and on cooling shrink. This shrinkage is taken up by the drawing away of molten metal from the thicker portions which are still fluid. If the shrinkage is at all uneven parts of the casting will be deficient in metal, and thus rendered weak and of incorrect dimensions.



Fig. 4.



Fig. 5.

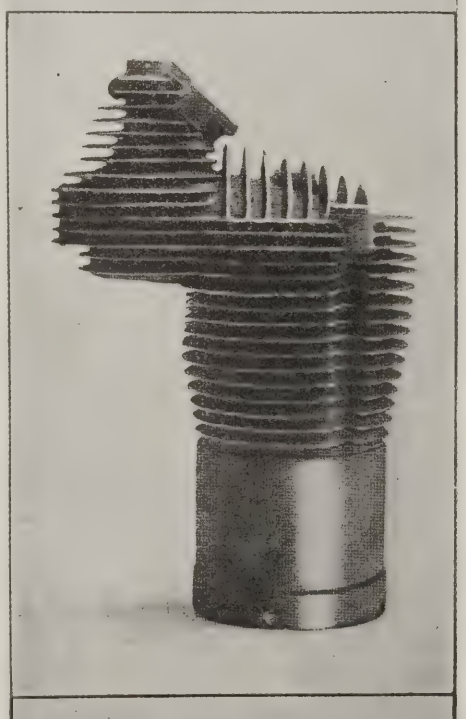


Fig. 6.
A typical cylinder casting.

Although the limits of size and weight are very fine, if due care is taken in moulding, a standard mixture adopted, and the relative shrinkage of the casting taken into account, no great difficulty should be experienced in this respect. When once a satisfactory casting is obtained the mixture, casting temperature, and moulding processes should all be standardized and rigidly followed out if successfully results are to be maintained.

Kiln Drying Woods for Aeroplanes

WHEN the United States entered the war the need for wood to build aeroplanes quickly created a difficult problem. Most of the air-seasoned wood available had been bought for aeroplanes for the allied nations abroad. Thorough air-seasoning of such stock requires from one to three years, according to the size and kind of wood. Kiln-dried stock under the methods ordinarily used has frequently proved unsatisfactory and for that reason air plane manufacturers have been reluctant to use it. If the needs of the fighting forces were to be met adequately and without prolonged delay, it was essential that methods of conditioning should be available in which full confidence could be placed.

Long before this situation developed the Forest Products Laboratory of the Forest Service, at Madison, Wisconsin, had been making a scientific study of the drying of wood, and had developed a method of drying which has been very successful with all the woods tried. Several kilns have been built at the laboratory for experimental purposes and a number of demonstrations made in commercial kilns. Ash and spruce are the woods most in demand for aeroplane construction, and anticipating the present situation, the Forest Service secured a shipment of partially air-seasoned ash and spruce plank for preliminary tests.

This material was kiln dried without injury. Later thoroughly green Sitka spruce, white ash (northern and southern), white oak, Douglas fir, western white pine, and mahogany were secured in the log for testing. The spruce and ash logs were cut up and the green material from each species divided into three matched groups. One group of each species was tested green, another has been set aside to be tested when it has air dried, and the third group was kiln dried, trying several methods, and then tested. Only the results of tests on the spruce have so far been analyzed. Comparison with standard tests which had already been made shows that Sitka spruce can be kiln dried from the green condition with no more, perhaps less, injury to its mechanical properties than by air seasoning. Definite specifications have been prepared for kiln drying spruce green from the saw for aeroplane construction, and, if rigidly enforced, they will insure kiln dried stock of this species equal to air dried stock.

A preliminary study of propeller construction has shown the need of such information on propeller woods The testing of the ash and other species now on hand, which include several propeller woods, is being pushed as rapidly as possible, and there seems reason to expect as favorable results as for the spruce.

National Advisory Committee Elects Officers

At the annual meeting of the National Advisory Committee for Aeronautics, held recently, Dr. W. F. Durand was reelected Chairman and Dr. S. W. Stratton was reelected Secretary for the ensuing year.

Members of the Executive Committee were elected as follows: Dr. Joseph S. Ames, Dr. Charles F. Marvin, Dr. Michael I. Pupin, Major General George O. Squier, U.S.A., Dr. S. W. Stratton, Rear Admiral A. J. Taylor, U.S.N., Dr. Charles D. Walcott.

At the organization meeting of the Executive Committee following the annual meeting of the full committee, Dr. Charles D. Walcott was elected Chairman and Dr. S. W. Stratton Secretary of the Executive Committee.

Existing subcommittees were continued and an Editorial Committee was appointed to prepare for publication the technical reports which will appear in the Third Annual Report of the Committee.

COMMERCIALIZED AIR TRANSPORT

By HARLAN D. FOWLER, Aeronautical Engineer

COMMERCIALIZED development of our aerial highways, which a few years ago was considered a dream of the dreamers, has now been brought to the front with a surprisingly large evidence of it being pushed forward and supported financially by many interested countries. Of these, the United States, England and Italy have shown unusual activities. The United States have made various attempts by organizing postal routes and transmitting mail from place to place, and at the present time plans are being made by the postal authorities to establish a large number of permanent routes. England has also made many attempts, and recently one of her large machines, the Handley-Page, made a flight from London to Rome. She has created a committee to look towards the attainment of aerial transport. The postal authorities of Italy have granted permission to a private concern to carry on postal service between Turin and Rome. A successful accomplishment of this project has already been made.

As in every thing else that is novel this new line of endeavor will have to go through many trials and tribulations before a satisfactorily sound basis of transport is established. That aerial transport is the coming enterprise cannot be doubted. The reliability and enormous carrying capacity of aeroplanes developed during the war is proving that this era will be with us soon. To date we have for references the Handley-Page 680 H.P. twin tractor battleplane, the Italian, Caproni triplane equipped with three 200 H.P. engines, and the German Gotha biplane with 540 H.P., all carrying large useful loads and giving satisfactory performances.

Looking forward to this, and knowing that America will not be far behind in this development, we will look around us and see where a reasonably logical step may be attempted for our first commercialized air transport. It is proposed to make use of a new method whereby a close preliminary design can be carried out without taking up too much time.

On account of the speed now possible of attainment we could count on an average air speed of 100-110 miles per hour. In order to keep the project on a paying basis we are to carry special mail to be sent exclusively through this medium, with accommodations for carrying passengers desirous of reaching their destination quickly.

Among a number of desirable points between which aerial transport may be tried out with reasonable success is between New York and Chicago, Ill., a choice made due to their leading commercial power and growth. The distance separating them may be roughly established at 750 miles, allowances being made for any irregularities in distance that may be caused by avoiding mountains, winds, storms, etc. At an average speed of 100 miles per hour it would take 7.5 hours to cover the distance of 750 miles. As Cleveland, Ohio is situated nearly midway between these points, it should be used as a resting station for the passengers and also for relieving the pilot and mechanicians by taking on fresh ones, or by substituting another aeroplane. A stop midway would be advisable, also, so as to lessen the fuel load to be carried. It will be shown shortly what effect this load will have on the performance of the machine. An average time of 4.3 hours from New York to Cleveland, Ohio and 3.2 hours from Cleveland to Chicago is therefore arranged. Some passengers may only come as far as Cleveland, while others may get on here. A stop of one hour would be ample. The total time for the entire trip thus being 8.5 hours.

While considering a speed of 100 miles per hour as an average, there must be taken in consideration the wind. Its velocity will vary for different seasons of the year and for different altitudes. Not having a definite knowledge of this variation the above average speed will be considered. However, with experience, the time of leaving may be so arranged as to take advantage of favorable winds. Interruptions due to very severe storms might occur at times, but the ordinary atmospheric disturbances could be properly handled with a speed of 100 miles per hour, and services could be rendered when all other means of transportation have been crippled.

In order to cope with disagreeable weather such as clouds, fog, or snow special apparatus for dealing with them will come into existence. Navigation under these conditions, especially when landing, may cause some discomforts at first, but as aerial transportation develops remedies are inevitable. For penetrating fog, or even clouds, powerful searchlights seem to be the only solution, unless the use of wireless telegraphy, or telephony, are found to be more suitable. As for the snow, properly constructed landing fields, or platforms, with appliances for quickly removing it from the path along which the machine is to run would appear as another solution to our numerous problems. It may come to pass that aeroplanes with high speed may be able to alight at a very slow speed, perhaps 30-35 miles per hour. If such slow speed is attainable many of the obstacles to comfortable navigation of the air will be very much simplified.

Continuing, for financial reasons and also as a matter of having sufficient reserve, 17 passengers are to be carried. If allowance is not made for a sufficient number of passengers to be carried the project would have little margin in which to make profit, outside of mail carrying. For example, it may be found that the cost of the entire trip for fuel, labor, depreciation, etc., amounts to $500. If at $50 per passenger and the aeroplane carries only 10 passengers the running expenses would just be paid, but by allowing for 17 passengers there would be a profit of $350 if this number was carried. The substitution of the weight of the mail for passengers is also to be considered, and similar allowance will have to be made for this. The following schedule for useful load to be carried between New York and Cleveland is drawn up. The useful load to be carried between Cleveland and Chicago would be much less, due to less fuel load, and consequently will not be considered in our design.

17 passengers @ 165 lbs.	2805 lbs.
Weight of luggage per pass. @ 30 lbs..	510 lbs.
1 pilot and 2 mechanicians @ 165 lbs..	495 lbs.
4.3 hours fuel for 2150 H.P. @ .517 lbs. per B.H.P. per hour	5000 lbs.
Total useful load to be carried	8810 lbs.

The luggage is an important item, as it concerns the passenger directly and as an ordinary satchel or grip can usually hold about 30 lbs. this weight per passenger is allowed.

2150 H. P. could conveniently be delivered by four 540 H.P. motors. A single motor has already given this power and at the present rate of power development 3 motors of 720 H.P. can probably be used.

Our most serious item is the fuel, which includes petrol, oil and water. On this, more than anything else, a stop part way would be a necessity. To travel right on through a fuel load of 7784 lbs. would have to be carried. As the machine will be flying at its maximum speed at all times in order to secure quick travel, the economical speed will have to be ignored. An economical speed in this case would be near an average of 75 miles per hour, but this would be too slow, comparatively, the train service would be only a few hours later. Only much saving in time would encourage the use of aeroplane service.

It can be shown that as the total weight of the machine increases a larger per cent useful load may be carried. This figuring on the present carrying capacity of aeroplanes, but beyond about 25,000 lbs. the percentage carrying capacity remain near 40 per cent. For our purpose, an efficiency of 40 per cent is desired and as a result the total load to be carried is $\frac{8810}{.40} =$ 22,020 lbs.

For an approximate estimate of the resistance of parts outside of the wings the following formula is useful

$$C_s = .0000175\ W \qquad (1)$$

where C_s is the coefficient for structural resistance and W is the total weight of the airplane. The value .0000175 was determined from 5 representative types of machines. It takes into consideration the area of all surfaces, except the wings, and the coefficient of structural resistance, and the weight, i.e.,

$$.0000175 = \frac{A\ K}{W} = \frac{C_s}{W} \qquad (2)$$

The coefficient of resistance K is for the area of surfaces only, while the coefficient of resistance C_s is for the weight of the machine only. Therefore knowing the weight of any machine and its speed we can determine the power required to overcome the resistance of all structural parts outside of the wings. For converging the value of C_s into structural resistance R in lbs., the formula is useful.

$$R = C_s \times V^2 \qquad (3)$$

where V is in miles per hour.

Our average speed for a duration of 4.3 hours should be 100 miles per hour. For a first approximation we must find what high speed at full and empty load we may expect to get. At the beginning of the trip we have 22,020 lbs., at the middle of the trip a load equal to the full load minus half the weight of the fuel, or $22{,}020 - \frac{5000}{2} = 19{,}520$ lbs., and at the end of the trip 22,020 — 5000 = 17,020 lbs. By proportion, we have, for full load, the high speed of

$$\frac{19{,}520 \times 100}{22{,}020} = 89 \text{ miles per hour.}$$

and at empty load, the high speed is

$$\frac{19{,}520 \times 100}{17{,}020} = 114.7 \text{ miles per hour.}$$

Substituting the values of W in formula (1) we have for full load

$$C_s = .0000175 \times 22{,}020 = .3854$$

and for empty load

$$C_s = .0000175 \times 17{,}020 = .2979$$

Applying these values to formula (3) we have, for full load at a speed of 89 miles per hour a structural resistance of

$$R = .3854 \times 89^2 = 3{,}053 \text{ lbs.}$$

and for empty load at a speed of 114.7 miles per hour

$$R = .2979 \times 114.7^2 = 3{,}919 \text{ lbs.}$$

Owing to the robustness of the U.S.A.1 wing section and its generally good characteristics we will employ it for our machine. The estimated resistance at 2° is 12 L/D and at 8° a L/D of 11.6 may be had. This allows for corrections due to triplane defects, aspect ratio, gap and stagger, etc. As L is equal to the weight of the machine, the resistance D of the wing is equal to the ratio L/D. Therefore, the resistance D for the full load is

$$D = \frac{22{,}020}{11.6} = 1{,}898 \text{ lbs.}$$

and for empty load,

$$D = \frac{17{,}020}{12.0} = 1{,}418 \text{ lbs.}$$

Collecting these values in the following table the horsepower required to fly the machine is calculated from the formula

$$\text{H.P.} = \frac{R'\ V}{375} \qquad (4)$$

where R' is the total resistance in lbs. and V in miles per hours.

Item	Full Load $V = 89$	Empty Load $V = 114.7$
Structural Resistance (R)	3053	3919
Wing Resistance (D)	1898	1418
Total Resistance (R')	4951	5337
Horse Power Required (H.P.)	1175	1632

An efficiency of 80 per cent. at the propellers would give 1720 available horsepower at ground level.

For an economical height of travel 3,000 feet is suggested. This would permit a splendid view of the country and at the same time give sufficient height to maneuver from in case of disability of the engines or some other accident. This nightmare of aviation is beginning to be a thing of the past, and therefore anticipation of trouble from this source is not to be encouraged. The temperature at this height would be about 15° lower than that at ground level, a variation of 5° for each 1,000 feet being the general rule for decrease of temperature. The author has already shown (AERIAL AGE, Aug. 20, 1917) that the power decreases as the square root of the percentage decrease of density (d), that is,

$$H.P._h = \frac{H.P.}{\sqrt{d}} \qquad (5)$$

where $H.P.$ is the horsepower required at sea-level, $H.P._h$ = the horsepower required at a specified height. In our case, at 3,000 feet,

$$H.P._h = \frac{1632}{\sqrt{90}} = 1720\ H.P.$$

and the available $H.P.$ equal to about the same as on ground level, or a little less. Whatever tendency there may be for an increase in speed at this height the fact that there is not enough power available will keep the speed for empty load near its calculated speed of 114.7 miles per hour. If there were sufficient power we would have been able to travel at about 120 miles per hour at 3,000 feet.

The low speed for full and empty load has been left out due to the amount of work required to go into details. That the machine should be a triplane is beyond doubt, and that the attainment of an average speed of 100 miles per hour with a slow speed of 50 miles per hour is quite possible. The ratio of the horsepower to the full load weight is admittedly low, being 10.24, while the fuel consumption per B.H.P. is low. Both of these items have shown marked improvement lately, and consequently it is to be anticipated that the weight of the fuel per B.H.P. per hour will average 3.5 lbs.

The ingenuity of the designer will be called upon here to turn out a machine that will appeal to the individual, both in leisure and comfort of traveling. A great accomplishment to this end would be the elimination of all noises, particularly the roar of the motors. The situation of the motors back of the passengers would help to lessen this nuisance. Vibrations should be easily avoided. The complete inclosure of the

(Continued on page 291)

MAKE-BELIEVE FLYING

It Puts a Timing Gear for Students on Thought and Action

By LAWRENCE LEON, Instructor Newport News Flying School

NO student is proficient in flying until he is so familiar with the controls that he works them instinctively. Mind, body and machine must become as one co-ordinated unit. The flyer then does the absolutely right thing at the right precise moment, apparently without thinking of it. This is a result possible to anyone who has the necessary qualifications to become an aviation student, but it is a result that is accomplished only after constant, patient practice.

The new student will find it a great help in his hours of leisure or when the weather is too bad to fly, to practice the controls on the ground. The student should sit in the machine and act as if he was in the air. To make a right turn he should press the rudder bar with the right foot and turn the wheel to the right; to make a turn to the left, he should turn the wheel to the left and press the rudder bar with the left foot.

Some student will say that this is a useless exercise, but in his first few lessons, this same student will turn the wheel to the right and push the rudder bar with his left foot when the instructor gives him the signal for a right turn. For him and all others, this practice on the ground with the controls is worth all the efforts put in it.

Practice on the ground should be carried on by advanced students, also, especially with the opening and the closing of the throttle. Ten out of eleven get in trouble when instructed to operate the throttle at the time of landing. First of all they fumble around to find the handle; then, although they know which way the throttle opens and closes, they forget all about that in the excitement of the moment and promptly move it in the opposite direction.

When they see the mistake, they get all the more excited and give the throttle a violent yank in the right way. That is a very bad thing to do, first, because the rods and levers which control the throttle are light and an undue stress will bend and jam them, making necessary a stop for repairs; and secondly, because yanking the throttle is hard on the motor since that slows it down very suddenly.

This mistake happens particularly with the nervous students and it is remarkable that they will do it over and over again. The reason may be all in the fact that in operating the throttle the student has to control the machine with one hand and not being used to it, he attempts to recover himself when he finds that he has allowed the machine to go out of its straight course.

The remedy is practice. This sort of student should get all the practice on the ground which he finds time for. He should sit in the machine and practice finding the throttle without looking until he can do so quickly and well. Then he is ready to practice opening and closing it. But he must THINK. That is the important thing: thinking. He should push the handle forward and *think* that he is opening it to accelerate the motor. When he pulls it, he should *think* that he is closing the throttle and shutting off the motor. Then he should imagine that he wants to land; to do so, he pushes on the elevator and pulls the throttle simultaneously with a gradual movement, never with a jerk.

Stiffness on the controls is another frequent trouble with most beginners. This fault is very difficult to overcome in some of them and it is generally due to nervousness and lack of confidence. There is absolutely no reason to hold the controls tightly for they work very easily. It is difficult for the instructor to correct a student's mistakes when the controls are held stiffly.

Ten minutes of this practice every day will save much time, money and worry for the student and will save the instructor from much fatigue.—Courtesy *The Curtiss Flyleaf.*

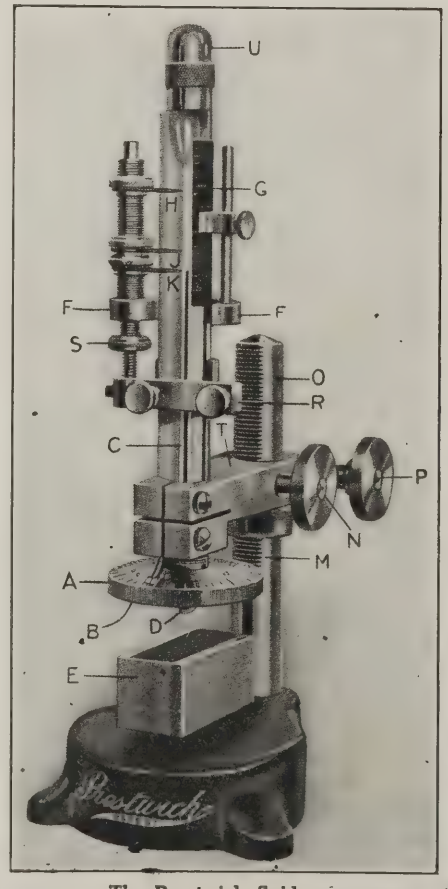
THE PRESTWICH FLUID GAGE

A FLUID gage for accurate test work in machine shops has recently been brought out by the Coats Machine Tool Co., Inc., New York. It is an entirely novel device for reliably checking large numbers of duplicate parts to close limits, 0.0001 in. or less. All readings of this gage are comparative only, being compared to a master dimension not necessarily known. We understand that a considerable number of these gages have been supplied to firms in the automotive industries, such as the ball bearing and electrical equipment industries. In aeromotor manufacture the gage is used for testing piston pins, push rods, push rod guides and valve stems. It is also used for testing steel balls as to accuracy of diameter and as to sphericity, for checking ball races, the grooves of ball retainers of annular races and as a tool room inspection gage for checking plug gages.

The instrument consists of fluid containing chamber A, having a flexible diaphragm B, a glass tube C of fine bore which is connected with chamber A, means for indicating the dimensions of the piece and means for correcting for variations of temperature. The diaphragm B is provided with a hardened steel anvil D. The article to be measured or gaged is placed between this anvil D and the fixed anvil E. Any pressure on anvil D causes the fluid to rise in glass tube C.

The chamber A is provided with a thread and micrometer index and pointer on the upper surface to indicate thousandths of an inch (or hundredths of a milimeter). Carrier F is provided with a scale G and three adjustable pointers H, J and K, the scale being divided to indicate ten-thousandths of an inch (or thousandths of a milimeter). The two top pointers H and J indicate the tolerance limits it is desired to work to. The bottom pointer K is set to the normal level of the fluid in the glass tube C. Carrier F is adjusted by means of thumb nut S to keep the bottom pointer K level with the normal level of the fluid, and thus compensate for variations of temperature.

The instrument is roughly set by rack M and pinion N on the pilar O to suit the article, the clamping screw P is then tightened up and the final adjustment made by the micrometer adjustment to a standard gage or piece of known dimensions. A displacement of the diaphragm B causes a displacement of the fluid level in the tube C relative to their respective areas. Any variation in the size of pieces placed under the gage is indicated by the difference in the height the level rises in the glass tube.



The Prestwich fluid gage

Aeroplane Fabrics

The general requirements and tests for aeroplane fabrics are well summarized thus:

(1) Fabric should present reasonably great resistance to flame.

(2) It should be proof against the action of salt water, moist air, extreme dryness, quick changes of temperature.

(3) It should not stretch in any direction.

(4) It should have a tensile strength of at least 75 lb. per inch width in any direction.

(5) The tendency to tear and split because of tacks, bullets, etc., should be almost nil.

(6) The weight should be taken in an atmosphere of 65 per cent. relative humidity at 70 deg. Fahr.

(7) The weight, yarn number, and tensile strength of the fabric should be obtained when it is in a bone dry condition, i.e., after it has been subjected to a temperature of 221 deg. Fahr. for two hours.

(8) Identity and average length of fibres should be ascertained.

(9) Determination should be made of the percentage moisture "regain" under the available range of temperature and humidity.

(10) A shrinkage determination should be made.

Commercialized Air Transport

(*Continued from page* 290)

passengers, mail, and pilot would be necessary. The question of putting the motors out on the wings, or inside the body, remains to be determined by current practice. For reasons of accessibility the motors should rightly be inside of the body, but for structural reasons the motors may perhaps be best situated outside. Swing chairs may be found advisable to take up the inclinations of the machine, otherwise the passengers are liable to be pitched forward when a landing is under way. However, a very flat glide may be successfully accomplished a[illegible] use of swing chairs may therefore [illegible] with.

The matter of cost [illegible] the enterprise in [illegible] of. In [illegible]

WHITEHEAD AIRCRAFT

THOUSANDS NOW IN USE ON THE FIRING LINE



J. A. WHITEHEAD
GOVERNING DIRECTOR

America's most difficult aviation problem today is not so much building the aircraft as guaranteeing its arrival safe and sound on the ground of operation.

The British Air Board has assigned to the Whitehead organization, the foremost establishment of its kind in the British Isles, contracts covering many thousand. They have been made in record time and delivered across the channel by the air route to the firing line. "Whitehead" has come to stand for performance in aerial operation.

A staff of 4000 trained operatives work night and day, housed in one of the most efficient factories in the world, covering acres of ground. Headed by inventive geniuses and tacticians, the Whitehead Aircraft Corporation occupies a position in the world of flying second to none.

Organized essentially for building peace craft for commercial use, nevertheless, in obedience to the dictates of patriotic demands, J. A. Whitehead, the Governing Director, arranged that British government needs should be taken care of first.

Such is the efficiency of the Whitehead works that the British contracts are thoroughly in hand, the commercial machines are well disposed of, and the factory is in a position to take on large new contracts and to perform all promises made to the letter. All types of land





WHITEHEAD AIRCRAFT ENDORSE

operating aircraft come within the dominion of Whitehead facilities. The reports made by the military and the civilian authorities of London and Paris furnish ample and convincing evidence of Whitehead construction, endurance, speed, ease of operation, and results.

Arrangements will be made with reliable American manufacturers desirous of shipping to London and there assembling for delivery on the firing line. Arrangements will also be made with reliable American manufacturers desirous of performing their contracts abroad—there is tremendous space and labor available for use through Whitehead channels.



BASIL BANCROFT — AMERICAN REPRESENTATIVE

WHITEHEAD AIRCRAFT LTD. (1917)
RICHMOND, SURREY, ENGLAND
J. A. WHITEHEAD, Governing Director

Literature and information concerning Whitehead Aircraft mailed upon request by

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Y BRITISH GOVERNMENT

FOR THE MEN WHO ARE TO GO OVERSEAS—III

HAVING received a number of requests from aviation instructors and students for French aeronautic literature and realizing that the students who will soon go to France should be familiar with the French aeronautic terms as popularly employed in descriptive literature—instead of merely giving a dictionary of terms; and realizing also the necessity of familiarizing them with the general features of the German machines which they will have to fight, AERIAL AGE sent to France for the very latest technical aeronautic literature and description of German machines.

The third instalment, given herewith, is part of a chapter of the work "L'Aviation Et La Guerre," edited for the Aero Club of France by Jean Lagorgette, the noted French aeronautic engineer.

Officer instructors have suggested that the best plan would be to print the French text without attempting to give the English translation of every word, as the first need is to supply the instructors with the necessary material, to enable them to read from the French and explain to the students while they take notes, which is the present practice in teaching all the other subjects.

In following this advice we are adding the most common terms and metric table equivalents to enable the instructors and students alike to quickly convert metric measurements into the English measurements and vice versa.

Notes, Relatives aux Avions Allemands (Third Instalment)

Per JEAN LAGORGETTE

Le décalage étant de 0 m. 22 entre bords antérieurs, et à peu près autant aux bords postérieurs en sens inverse, la partie médiane des ailes se trouve donc presque symétrique, dans le même plan vertical.

Les mâts sont en V, formé de 2 tubes soudés à la base.

Le haubannage d'avant en arrière est assuré, de chaque côté, par un câble presque horizontal qui joint le nez de l'appareil à la base du mât.

Les longerons du plan supérieur règnent sur toute l'envergure. En arrière, ce plan a une échancrure arrondie de 0 m. 48 × 1 m. 35.

Le plan stabilisateur fixe conserve une profondeur de 1 m. 62 et une envergure de 2 m. 40 (y compris le fuselage, interposé); et le gouvernail de profondeur 0 m. 51 × 2 m. 40.

La ligne de vol passe à 17 mm. au-dessus du milieu du 3e longeron que le fuselage comporte à mi-hauteur, et qui aboutit au plan stabilisateur horizontal.

Comme au D. II, moteur Mercédès (n° 26.786, etc.), 175 HP, et hélice Axial de 2 m. 73 de diamètre et 2 m. 20 de pas. — Mais le radiateur, en tubes plats transversaux, est logé dans le plan supérieur, et il n'y a donc plus de nourrice d'eau sur le moteur.

Benzin-Uhr-Maximal. — Compte-tours Taxamètre — compteur kilométrique.

Poids à vide: 675 kg. — Charge utile, en plus du plein de combustible, 135 kg

3° Torpedo D... (ou L. T. G.)

La Luft-Torpedo-Gesellschaft, de Johannisthal, société de création récente, construit un « torpilleur » de chasse qui a exactement le même aspect que l'Albatros de chasse.

Ailes sans V ni flèche, presque rectangulaires; mais les inférieures un peu moins profondes que les supérieures.

Les supérieures affleurent le fuselage.

De chaque côté, 1 paire de mâts, très rapprochés l'un de l'autre (le longeron postérieur laissant derrière lui plus de moitié de l'aile) et se rapprochant encore un peu plus à leur base.

Ailerons non débordants, et compensés par un bec analogue à ceux des nouveaux gouvernails allemands.

Gouvernails de l'Albatros de chasse; gouvernes de direction, également au-dessus du fuselage et formant un ensemble un peu plus ovale.

Le T. A., surtout ses jambes postérieures, — est situé un peu plus en avant. — Hélice avec calotte. — Moteur fixe 175 HP.

4° Roland de chasse D. II

Le Roland de chasse D. II présente quelques différences avec le Roland à tous usages.

Le D. II 678/16 a été capturé tout récemment.

Sa longueur totale est de 6 m. 85, et sa hauteur, de 2 m. 70, plus 0 m. 10 pour le dépassement de la nourrice d'eau.

L'envergure des ailes supérieures est de 9 m. 05 · celle des ailes inférieures, de 8 m. 50.

Ses ailes sont superposées (et non très décalées comme au biplace). Les supérieures sont fixées à une arête du fuselage. Ni les unes ni les autres ne sont en V.

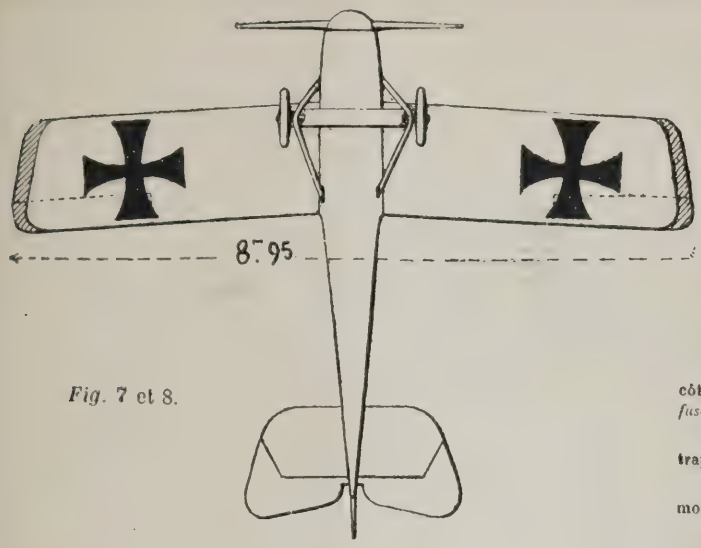
Elles comportent deux mâts ordinaires en tube, de chaque côté, donnant aux ailes un écartement de 1 m. 35, tandis que le biplace n'a qu'un mât unique, en bois et contreplaqué, profilé, incliné et très court (1 m. 20).

Elles sont en flèche et légèrement trapézoïdales.

Les ailerons, comme au biplace, n'en débordent pas; mais au lieu que leur pivot soit oblique par rapport à l'axe de l'appareil et que leurs commandes combinent des guignols avec celles du Nieuport, — ils sont rectangulaires et leurs commandes peuvent par conséquent être du type Nieuport pur : 2 biellettes verticales, faisant pivoter sur lui-même au moyen d'un guignol un long tube logé dans l'aile supérieure et dont la partie extrême sert d'axe à l'aileron.

La profondeur d'aile est de 1 m. 45. — L'incidence est de 4° à la 2e nervure près du fuselage, et de 3° à la 7e nervure (près des mâts), aux ailes inférieures droite et gauche.

Longerons en sapin évidé, marouflés à plat en toile mince; les antérieurs de 40×85, les postérieurs de



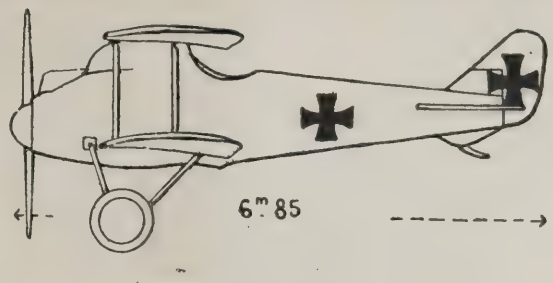


Fig. 7 et 8.

ROLAND D. II

AILES : Envergures *presque égales ; une seule paire de mâts*, de chaque côté ; ailes non *en V*, mais *en flèche*, un peu trapezoïdales ; *fixées au fuselage.*

GOUVERNAIL de direction : assez élevé ; — de profondeur : *presque* trapézoïdal.

FUSELAGE : gros, avec arête pour fixation des ailes supérieures, monocoque arrondi, avec calotte à l'avant.

MOTEUR fixe Mercédès 175 HP.

52×65 à 70 mm. Bords antérieurs et postérieurs en sapin, les postérieurs en 3 épaisseurs, dont celle du milieu est entaillée pour loger l'extrémité des nervures. Bord extérieur en frêne.

Nervures en peuplier, avec chapeaux en frêne ; quelques-unes sont renforcées par un très large chapeau, avec âme d'un seul côté et non au milieu ni double.

Les **gouvernes** de direction ont un contour triangulaire arrondi, analogue à celles de l'Albatros de chassé, mais le volet mobile descend derrière l'extrémité du fuselage au lieu d'être entièrement en retrait au-dessus de ce fuselage, et le plan fixe est réduit d'autant.

Les gouvernes de profondeur ont un aspect demi-hexagonal très arrondi.

Les volets mobiles, tant verticaux qu'horizontaux, conservent le contour d'oreille des anciens Albatros et des Rumplers, et ils sont tous compensés par la pointe qui est à la mode en Allemagne. Les parties fixes sont épaisses, charpentées en bois et revêtues de contreplaqué ; le plan de dérive est fixé à demeure.

Le **fuselage**, relativement gros, est un véritable monocoque, de coupe arrondie, avec « calotte » à l'avant.

Il comporte, à sa partie supérieure, une sorte de quille renversée ou d'arête, d'aspect plein, qui fait saillie et sur les côtés de laquelle sont fixées les ailes, à deux fermes cloisonnées du fuselage. — Les ailes inférieures s'adaptent sur les côtés de parties fixes, d'amorces d'ailes, qui sont fixées à demeure au fuselage, et se fondent avec lui, suivant le souci manifeste de Roland d'éviter les arêtes vives et d'arrondir tous les angles, saillants ou rentrants.

La charpente consiste en de très petits longerons, dont un à mi-hauteur, sur lesquels sont appliquées des bandes de placage croisées, dont l'ensemble, d'un seul bloc, forme un contreplaqué spécial, mince et revêtu d'une légère toile. Les six couches de bois et la toile forment seulement une épaisseur totale d'un millimètre et demi.

Le tout est, comme les ailes et gouvernes, peint en vert et marron.

Train d'atterrissage : 2 roues, à la pointe de 2 V assez hauts et en tube profilé de petit diamètre.

La béquille est montée sous une « mandoline » imitée des Nieuport et en partie incorporée au fuselage.

Moteur Mercédès 175 HP, avec échappement dirigé obliquement vers le bas, comme sur l'Albatros de chasse.

Le radiateur est logé dans les ailes supérieures. Il a 0 m. 80 de largeur, sans V.

2 **mitrailleuses** de Spandau fixes, parallèles, logées sous le capot, une de chaque côté du moteur, qui les actionne, et tirant en avant à travers l'hélice.

Levier de commande à deux poignées, genre Fokker.

Le poids à vide est de 660 kilos ; la charge utile de 167 kilos, en plus du plein d'essence.

EQUIVALENTS

1 METER = 39.37 INCHES

Legal Equivalent Adopted by Act of Congress, July 28, 1866.

LENGTH

Centimeter	=	0.39.37	inch
Meter	=	3.28	feet
Meter	=	1.094	yards
Kilometer	=	0.621	statute mile
Kilometer	=	0.5396	nautical mile
Inch	=	2.540	centimeters
Foot	=	0.305	meter
Yard	=	0.914	meter
Statute mile	=	1.61	kilometers
Nautical mile	=	1.853	kilometers

AREA

Sq. centimeter	=	0.155	sq. inch
Sq. meter	=	10.76	sq. feet
Sq. meter	=	1.196	sq. yards
Hectare	=	2.47	acres
Sq. kilometer	=	0.386	sq. mile
Sq. inch	=	6.45	sq. centimeters
Sq. foot	=	0.0929	sq. meter
Sq. yard	=	0.836	sq. meters
Acre	=	0.405	hectare
Sq. mile	=	2.59	sq. kilometers

VOLUME

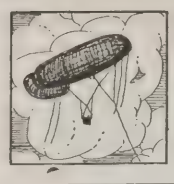
Cu. centimeter	=	0.0610	cu. inch
Cu. meter	=	35.3	cu. feet
Cu. meter	=	1.308	cu. yards
Cu. inch	=	16.39	cu. centimeters
Cu. foot	=	0.0283	cu. meter
Cu. yard	=	0.765	cu. meter

CAPACITY

Milliliter	=	0.0338	U. S. liq. ounce
Milliliter	=	0.2705	U. S. apoth. dram
Liter	=	1.057	U. S. liq. quarts
Liter	=	0.2642	U. S. liq. gallon
Liter	=	0.908	U. S. dry quart
Dekaliter	=	1.135	U. S. pecks
Hectoliter	=	2.838	U. S. bushels
U. S. lik. ounce	=	29.57	milliliters
U. S. apoth. dram	=	3.70	milliliters
U. S. liq. quart	=	0.946	liter
U. S. dry quart	=	1.101	liters
U. S. liq. gallon	=	3.785	liters
U. S. peck	=	0.8881	dekaliter
U. S. bushel	=	0.3524	hectoliter

WEIGHT

Gram	=	15.43	grains
Gram	=	0.772	U. S. apoth. scruple
Gram	=	0.2572	U. S. apoth. dram
Gram	=	0.0353	avoir. ounce
Gram	=	0.03215	troy ounce
Kilogram	=	2.205	avoir. pounds
Kilogram	=	2.679	troy pounds
Metric ton	=	0.984	gross or long ton
Metric ton	=	1.102	short or net tons
Grain	=	0.0648	grams
U. S. apoth. scruple	=	1.296	grams
U. S. apoth. dram	=	3.89	grams
Avoir. ounce	=	28.35	grams
Troy ounce	=	31.10	grams
Avoir. pound	=	0.4536	kilogram
Troy pound	=	0.373	kilogram
Gross or long ton	=	1.016	metri c tons
Short or net ton	=	0.907	metric ton



MILITARY AEROSTATICS



Escaped Goodyear Kite Balloon Recovered

AFTER an exhaustive three day's search, during which the chiefs of police in a dozen large cities, and all the important news gathering associations that serve our country's newspapers, combed the eastern section of the United States for an escaped military kite balloon belonging to the Goodyear Tire & Rubber Company, of Akron, Ohio. The big sausage-shaped bag—80 feet long and 22 feet in diameter—has at last been located and returned to the Goodyear aeronautical field.

The big bag got away during a terrific storm which passed over the flying field, tossing and whipping the balloon about until it broke loose from its moorings and embarked skyward upon an aimless three days' tramp

The balloon disappeared from view riding a fifty-mile gale, at a height of two miles. Naturally there was much speculation as to its probable course. Had there been an occupant in the basket, suspended below the bag, no difficulty would have been experienced in bringing it down to earth within a few miles. The simple operation of letting out a sufficient quantity of gas would have caused its descent.

Kite balloons are intended only for observation purposes, and when in actual service are held captive, at whatever height desired, by a cable, but when unrestrained, they operate in practically the same manner as free balloons, such as are used in making exhibition flights at fairs, carnivals, etc.

So, with no human element entering into the matter, there was nothing to do but wait until the balloon's gas supply became exhausted through leakage, and trust to good fortune that it would come down some place near civilization.

After an anxious wait of three days, however, word came from Salem, Ohio, about 60 miles from the Goodyear field, that the tramp balloon had been located about six miles from that city. Singularly enough, the runaway was discovered by an old-time balloonist, Dr. W. T. Thomas, who achieved considerable notoriety some years ago as a baloon pilot in the days when the bags were inflated with heated air, instead of with hydrogen gas as at present.

Dr. W. T. Thomas had just purchased a stretch of timber land, and was engaged in a tour of inspection when he came upon the missing kite balloon in an open space in the woods. Identification was easy as the sand bags in the basket bore the company's name, and as the discoverer happened also to be a personal friend of F. A. Seiberling, president of the Goodyear Tire & Rubber Company, the discovery was at once reported to him and a motor truck immediately dispatched to transport it back to the aeronautical field.

Each kite balloon is equipped with a rip-panel—a narrow strip of balloon fabric, which ballonists open only in emergencies to make quick landings. It is thought that the rope connecting this strip of fabric with the basket caught on the limb of a tree, pulling the rip-panel open and that the leakage of gas so caused brought the balloon to earth. Upon examination the balloon was found to be absolutely unharmed, and a few hours after its return was again sent up into the air.



Kite balloon and seaplane maneuvering with U. S. Naval vessel "somewhere off the American coast." Photo passed by censor



One of the large French dirigibles passing over a French aerodrome

Yale Plans Aero School

New Haven.—A school of military aeronautics at Yale University has been planned, and sanction now rests with the War Department. Students enrolled will take their aviation training with regular studies. The first class will be started next June and the members sent to flying schools either in this country or France.

The Aero Club of America is supporting the project, which already has been indorsed by the university authorities. The school will be under a commandant detailed by the chief signal officer of the army.

Nutley Can't Bar Airmen

Chief Justice Gummere, of the New Jersey Supreme Court handed down a decision in Newark that the anti-aircraft ordinance recently passed by the Nutley, N. J., town authorities to prevent aeroplanes and balloons from landing in the village is not legal and cannot be enforced. The court held that a man can land in Nutley from the air provided he does not land in a street or on municipal property. If he lands on private property that is a matter between him and the owner of the property, the decision said.

Justice Gummere's opinion was handed down on the appeal of Henry Wernsing, who was convicted after he had landed in Nutley from a balloon. He was fined $25 for landing in the town, despite his contention that he was unable to stay up in the air long enough to pick out a town to land in. The decision sets the conviction aside.

FOREIGN NEWS

BELGIUM

During the twenty-four hours on Oct. 15, bombing raids were carried out by the British on the following objectives: the Bruges docks, Varssenaere aerodrome, and Houtaye aerodrome. Large quantities of explosives were dropped with good effect, all the machines returning safely.

British airmen in their recent attack on the Belgian town of Roulers caused the destruction of an arsenal in which was quartered a newly arrived German regiment. This information was contained in a dispatch from Amsterdam to the Central News Agency and was reported by a trustworthy correspondent on the Dutch frontier.

One of the first incendiary bombs struck the arsenal, which immediately burst into flames. The confusion was added to by airmen, who, descending to a low altitude, used their machine guns freely, thereby adding to the already enormous casualty roll.

FRANCE

Ten persons were killed and forty wounded in a bombardment of Nancy on Oct. 16 by German aviators, the War Office announces. On Monday and Tuesday (Oct. 15 and 16) twenty-five German aeroplanes were destroyed by the French or compelled to land in damaged condition. The communication adds that French bombarding squadrons made a number of expeditions. Numerous projectiles were dropped on military establishments at Volkingen, railway stations at Thionville, Mezieres-les-Metz and Woippy, and factories at Hagondange and Rombach.

Twenty bombs were dropped by aviators on the evening of Oct. 18 in the region of Dunkirk. No victims are reported. On October 16 two German aeroplanes were brought down by Section 510, of the automobile artillery.

Paris, Oct. 21.—Although at first it was believed that the flight of the Zeppelin fleet over France yesterday was an independent raid and the first step toward carrying out the threat made in a German wireless message, which said it had been decided to destroy Paris in reprisal for French air raids on German towns, it now is generally believed that these eight Zeppelins, four of which were destroyed or captured, were returning from England and had lost their bearings owing to fog and probably had lost touch with their wireless communications.

The log book of the Zeppelin which landed intact shows that she had been to England, and prisoners from three other airships confirm this. One of the men captured said it was want of gasolene that forced his Zeppelin to descend.

The raid is widely proclaimed by French observers as being definite proof of the superiority of the aeroplane over the Zeppelin.

An official note issued by the War Office gives the following summary of the Zeppelin raid:—

The first Zeppelin was brought down by artillery at St. Clement.

The second was forced by an aviator to land near Bourbonne-les-Bains.

The third was forced down at Laragne, near Sisteron. The crew of four officers and fifteen men were taken prisoner after they had burned the airship.

The fourth Zeppelin was brought down in the same region about two P. M.

The fifth and sixth airships were reporting passing above the Gap and were out of control.

The seventh landed at Montigny-le-roi, debarked its wounded occupants, threw out ballast and then left. It was chased by aviators in the direction of Dole and Besancon and later was signalled, together with the eighth Zeppelin, as passing over Pontarlier, in the Cote d'Or, making for Switzerland.

GERMANY

The Reuter correspondent with the French army says that information in the hands of the French General Staff shows that the Germans are making feverish preparations to meet the Americans in the air next spring. The number of German battleplanes is to be doubled during the winter, and aeroplane and motor factories throughout Germany are being enlarged.

The Fokkers, who are building great fleets of fighting planes and triplanes, remarkable for speed and climbing, have taken over the great Perzina piano factories in Schwerin. For bombing formations, heavy three-seaters are being built to carry nearly a ton of bombs apiece.

Ten enemy aeroplanes and one captive balloon were shot down on Oct. 16.

Dunkirk has again been attacked by German aviators, who observed conflagrations caused by their bombs.

In reprisal for the dropping of bombs by enemy aviators on open German towns, bombs have been dropped by German aviators on the town of Nancy, lying within the region of the French operations. Large fires resulted.

GREAT BRITAIN

London, Oct. 16.—Formal announcement that England intends to make reprisal in kind for the German air raids over unfortified British towns was made in the House of Commons this afternoon by Chancellor of the Exchequer Bonar Law.

He stated that it was the government's intention to make air raids and bombard German towns "as far as the military needs will release the necessary machines."

London's bomb-proof shelters are being card-indexed in preparation for further German raids. Sufficient tunnels, arches, crypts, basements and substantial buildings have been inventoried to accommodate 1,000,000 persons.

On Tuesday, Oct. 16, a British fighter patrol downed a double-seater enemy machine in the vicinity of Zarren. The observer fell out, and the machine turned over and fell in flames.

British airplanes carried a very successful bombing raid in the afternoon of Oct. 17 into German territory. A factory west of Saarbruecken, some forty miles beyond the German frontier, was attacked, and many bombs were dropped, with good effect. Fires were seen to break out in the factory.

On the 16th British aeroplanes took advantage of a fine period from dawn until 3 o'clock in the afternoon to carry out artillery work and photograph. A large number of bombs also were dropped during the day on hostile billets, hutments and trenches.

Two German machines were brought down in air fighting and another was shot down by anti-aircraft guns. One British machine is missing.

ITALY

Rome.—The award to Gabriele d'Annunzio, for his daring air raid on Cattaro, of his fourth medal for valor since the opening of the war, gives great satisfaction here. The poet is flooded with congratulatory telegrams, among others that of the Caproni brothers, which reads:

"To the ideal commander of the most daring squadron; to the knight of the skies who transforms enthusiasm and faith into lasting action; to him who inspired the great war in the air, our homage of admiration and devotion."

Discussing his raid on Cattaro, d'Annunzio said:

"In my opinion it was the most extraordinary ever attempted by aeroplanes fitted for flying overland. We crossed the sea with little aid from the compass, making more than 250 miles without any landmark.

Numerous enemy aeroplanes attempted on Oct. 16 to fly over Italian territory. Hindered by anti-aircraft fire and repulsed by chasing squadrons, they had to return to their lines. Only a few of them succeeded in reaching their objective and dropping bombs. There were no casualties and no damage resulted.

The Daily Mail's correspondent with the Italian Armies says that later details received of the great Cattaro raid mark it as an example of rare organization.

The fourteen Capronies which took part in it started together from near Milan, flew to the Appenines in a gale and arrived in a body near Rome. There they rested a while and then flew to their taking off camp on the Adriatic shore and thence to Dalmatia and Montenegro and home.

The squadron afterward flew together something like 1,000 miles without failure on the part of any machine or any hitch.

RUSSIA

German naval aircraft on Oct. 16 dropped bombs on Pernau, a Russian port on the Gulf of Riga, where large fires were observed.

A fleet of Zeppelins was reported over Moon Sound, northeast of Oesel Island.

Petrograd, Oct. 17.—On the Baltic, profiting by the calm, bright weather, the Germans have been actively engaged in aerial scouting, principally in the region of the Baltic islands. Russian aviators ascended to meet the enemy. In an aerial engagement the Russian aviator, Safonoff, brought down an enemy machine, which fell in the Russian lines. A Zeppelin flew over Moon Sound, northeast of Oesel Island.



The testing field of a large aircraft factory, where new machines are tried out before shipment



MODEL NEWS

Edited by G. A. Cavanagh



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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

From Models to Flying Machines

AN interesting story showing the advantages that an English model builder derived from his experimentation is given in "Flight":

Eight or ten years ago a brilliant young sculptor and artist in the quietude of his own study devoted many hours of his over-full time to the design and building of model aeroplanes—little machines which flew. The fascination of the pastime was not appreciated by his friends, but that bothered the sculptor never a whit. Then the dawn of flying broke, and the modelist's thoughts turned to the real thing with longing. With the outbreak of war his ambition was achieved, and a full-sized aeroplane was worked out and built. As a natural outcome of this success, for the time the surroundings of the studio lost most of their attraction, and with the opportunity opening out of a chance to serve the nation came the decision to enter in earnest the ranks of aeroplane constructors. That young sculptor was R. F. Wells, who from such a beginning in the early part of 1915 has since so forged ahead—under the title of the Wells Aviation Co., Ltd.—at such a pace, that he only limit to the capabilities of the firm turning out more and more fighting machines—which are so urgently needed for the front—is the capacity of the works, and the further call of a certain amount of necessary capital. Primarily the idea was a patriotic desire to help fill the Nation's dire requirements, but in spite of this very considerable profits have resulted, although these it has been necessary to invest in tangible assets, to provide for the continuous and insistent expansion, due to the call of the Government for ever-increasing output.

It is a remarkable monument to individual perseverance and efficiency which the Wells Co. have erected down Chelsea way, and incidentally to the benefit of Chelsea. Take merely one of the many sections of the works, which comprise shops capable of dealing with every item of aeroplane construction, from the raw material to the finality of the complete machine. This section, covering about one and one-quarter acres, four months ago was waste land. Now it is in full power, helping to turn out some of the latest and best machines flying at the front, whilst the buildings have been designed and constructed by the Wells Co. as a side line. And this is but an item in the whole concern. The other day, when we had run through the various departments under the very enthusiastic guidance of Mr. Wells, it was almost with a feeling of bewilderment that we emerged in some totally different district to that in which we started our rounds. Throughout the tour of the different shops the music of the hundreds of machine tools, the drone in the woodworking department, and the varying notes attaching to the many other shops, with the big doping shops as a quiet relief from the otherwise universal din, left little opening for continuous converse. But at every point the hum of work in progress told its own tale, and it was a satisfaction to think that all this toiling was for the direct and immediate good of our fighting forces and for the help of the Empire as a whole.

In the timber yard are ranged stacks of ash, and of a quality to demand the admiration of an expert, running into many thousands of pounds' value in the rough. This item is but another instance of the foresight of Mr. Wells, who gauged the demand for this wood, and now the result is seen in this probably unexampled matured stock, which, for aeroplane purposes, is probably beyond valuing in mere £ *s. d.* Hard by is a saw-pit, where the first division takes place; and from there the planks pass through the various shops until they take their place in the roofs in the form of various complete parts for which they were designed, ready in their temporary resting place to be drawn upon for assembly in the main erecting shop, and so away to the flying ground for final testing. Throughout the works there is evidence of a splendid margin of stock, giving promise of completed machines by the score. It is well that this is so, for the firm have in hand for the Government orders for complete machines which will help considerably to reduce the margin of "spares." The remunerative prospects of such a business are almost without limit, but in this direction the whole thing is naturally a matter of capital, as limits of expansion must necessarily be reached when the weekly outgoings begin to overlap the immediate returns for "work accomplished." Such is the Wells combination at Chelsea, with its 1,600 employees, which, originating in model making, commenced by sub-contracting for parts in quantity for such machines as the DH^1 and DH^2, has now attained the proud position of undertaking the entire machines from A to Z.

More About "Scale Models" and "Flying Sticks"

MR. J. H. BIDDLE of 116 Broad street, N. Y., says he has read Mr. W. E. Evan's article on Scale Models and was very much impressed as he has built a good number of models, and finds that the people do not enthuse over the Scale Models, for they do not fly as well as the "Flying Sticks."

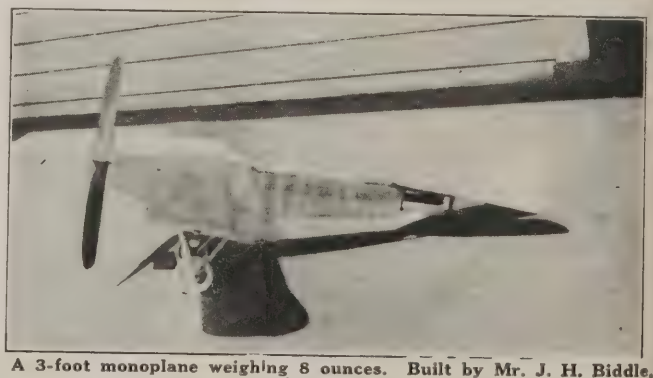
He says: "I would encourage the model builders to build more Scale Models as there is plenty of room for improvement. I started building models that resembled the Man-Carrying Aeroplane—but had to switch to the Flying Sticks as I wanted something to fly. The Flying Sticks (or racing models) soon got on my nerves as they were *impossible* imitations of the real aeroplane.

"I am now building three and six-foot Scale Models and have thus far obtained very good results—also with a three-foot monoplane of my own design. It cannot be called a Scale Model as it is not built from any special model of the large machine; but as far as construction and appearance are concerned, it is practically the same as the Man-Carrying Aeroplane.

"The accompanying picture shows my own three-foot monoplane. It is a four-stick fuselage (covered) and double ribs in the main planes—36-inch spread of the main plane—25-inch fuselage—12-inch propeller—driven by a rubber strand motor. Ball-bearing propeller shaft—2-inch stream line disc—wheels (rubber tired)—rubber band shock absorer on the landing gear. Total weight 8 ounces.

"This machines has made flights ranging from 150 to 200 feet—at an altitude of 20 feet with this model."

Mr. Biddle is now working on a small four-cylinder compressed air motor, radial type for a six-foot Curtiss Scale Model, and will let us know of his results.



A 3-foot monoplane weighing 8 ounces. Built by Mr. J. H. Biddle, of New York.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

How Could He?

A squad of raw recruits composed of English and Irish were being drilled by a sergeant who had become exasperated by their seeming stupidity.

"Double!" was the command given, and all of the men obeyed with the exception of one, who remained in a fixed position gazing into vacancy.

"Why, man, don't you know anythin' about doublin'?"

A gleam of comprehension passed over the face of the recruit. "No, sorr; I'm a Cork man."—*Courtesy of Life.*

Military Information

Miss Quizitor: Oh, Mr. Winger, why do you carry those awful bombs when you fly?

Lieutenant Winger (*of the Aviation Corps*): You see, when I'm surrounded by clouds I need them to blow an opening in the silver linings.

Exposing His Ignorance

Landsman: What's the horsepower of that engine you're running?

Jackie: It's got no horsepower. Can't you see, it's a donkey engine.

The Recruiting Office

By Charles F. Clark, Sergeant U. S. A., Boise, Idaho.

He entered briskly, approached the Sergeant's desk and said: "My father was French, and my mother German. Consequently, I've been at war with myself internally ever since 1914. Now, I want to get into it in reality."

He was accommodated.

A country boy, long-eared, cadaverous and horny-handed, appeared. He was bashful and retiring, but finally managed to blurt out:

"I want ter join the Aviration Corpse!"

A few questions brought out the fact that what he did not know about gas engines would fill a book. He was sent out to get a letter from a former employer stating that he had driven an auto or truck, and soon returned. Clutched in his right hand was a crumpled letter which he handed to the Sergeant with a feeling of pride. It read:

Moss, Idaho, August 24, 1917.

To Whom It May Concern

This is to certify that———— has had some experience in driving automobiles. He has driven my Ford car several miles.

ABNER JONES.

"Take my advice, Lorenzo," said the Sergeant; "you stay on Mother Earth a while. Sign your name right here on the dotted line. The infantry needs you."

He signed.—*Courtesy Judge.*

A Receipe for Peace

Take equal parts of French, British and American soldiery, mix in assorted ordnance, roll mixture steadily from west to east until German frontier is reached, then frost thickly with aeroplanes and serve as quickly as possible.—*Life.*

Why He Was Apprehensive

Sandy McTavish was a highly-skilled workman in a new aircraft factory.

Therefore, it happened one day that Sandy was asked if he would care to accompany the works aviator on one of his trial flights in a machine.

Sandy, after some hesitation, agreed to do so.

During the flight the aviator asked how he was enjoying it.

"To tell the truth," answered the Scot, "I wad rather be on the groun'."

"Tut, tut," replied the flying man. "I'm just thinking of looping the loop."

"For Heaven's sake don't dae that!" yelled the now very nervous McTavish. "I've some siller in my vest pocket."—*Tit-Bits.*

Essential

The novice was not enjoying his first trip through the air and his more experienced companion regarded him in some amusement.

"I say, Bill, what's or your mind?" he demanded.

"I was just thinking about Abraham Lincoln," replied Bill thoughtfully.

"Abraham Lincoln?"

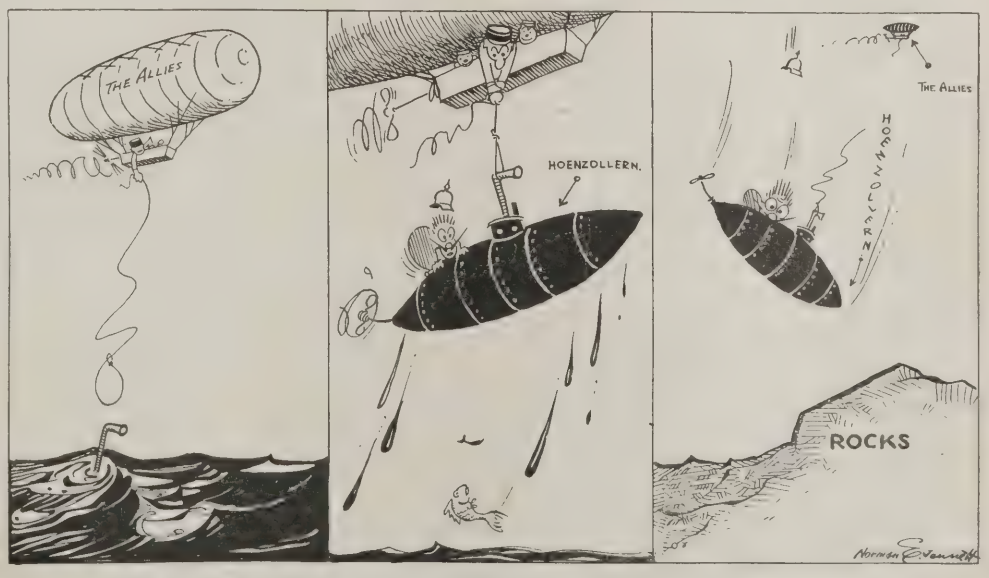
"Yes. I was thinking how truthfully he spoke when he said a man's legs ought to be just long enough to reach the ground."

A certain section of the volunteers had been engaged the whole of one Sunday morning in learning the art of building aeroplanes.

For the last hour or so they had worked alone, as their instructor was engaged elsewhere. But before they were dismissed he came to inspect their work.

"Why, this affair would collapse in half an hour!" he exclaimed in angry surprise, indicating where the struts on one side were all attached wrongly.

"That's all right, sir," replied the one who had attached the struts. "This aeroplane is designed for the enemy!"



Overcast **Rising Temperature** **Slightly above zero**

Present day weather conditions and a dirigible

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REMARKABLE NEW AEROPLANE DOPE AND REAL FIRE-PROOF PAINT

that meet every standard requirement, and in addition

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This remarkable new Dope, besides being absolutely fire-proof, will by our process render your plane fabrics

Drum Tight and Strong, Absolutely Smooth, Water and Weather-Proof and is Non-Poisonous in Application, Tough and Flexible, with Proper Shrinkage Allowance, and our

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Oil and gasoline spilled or splashed on plane surfaces, if ignited by engine backfire, cannot burn fabrics treated with our new dope—the fire cannot touch the fabric and will not spread beyond the oil covered area.

SPAR VARNISH REMOVER

We also make a "cleaner" or spar varnish remover with which spar varnish can be easily and quickly removed without in any way affecting the under coating of our special fire-proof dope. It makes the re-doping of any part or the whole of a surface a simple and easy matter and eliminates the necessity of disassembling and reconstructing the part affected, with a saving and economy that can be readily appreciated.

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149 Broadway

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1 Rue Ambroise-Thomas

Extracts from S. O. 240

(*Continued from page* 285)

George H. Robertson, Av. Sec. Signal Corps. Paragraph 165, S. O. 233, Oct. 6, 1917, relating to First Lieut. Charles G. Miller, S. O. R. C. is revoked.

First Lieut. William P. White, Av. Sec. S. O. R C., to New York City, N. Y., reporting to commanding general, Eastern Department, for duty as assistant to the Department Aeronautical Officer.

First Lieut. Thomas Kissane, S. O. R. C., to active duty, Signal Corps Training Camp, Fort Leavenworth, Kans.

First Lieut. Charles Gullick, Av. Sec. S. O. R. C., active duty at Wilbur Wright Field, Fairfield, Ohio.

First Lieuts. Samuel T. Moore, Allan P. McFarland, and Charles L. Hayworth, Av. Sec. S. O. R. C., active duty at Army Balloon School, Fort Omaha, Nebraska.

First Lieut. Jacob H. Longnecker, Av. Sec. S. O. R. C., to active duty at Signal Corps General Supply Depot, Middletown, Pa.

First Lieut. William W. Rohbach, Av. Sec. S. O. R. C., to active duty, Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. William R. Becker, Av. Sec. S. O. R. C., to active duty at Kelly Field, South San Antonio, Texas.

Capts. Joseph L. Eastland and Richard Poillan, Av. Sec. S. O. R. C., to active duty reporting to the Chief Signal Officer of the Army for assignment to duty.

First Lieuts. Warren E. Eaton, Alfred W. Lawson, and C. Marvin Kelland, Av. Sec. S. O. R. C., to active duty at Selfridge Field, Mount Clemens, Michigan.

First Lieut. John B. Weir, Av. Sec. S. O. R. C., to active duty at Hazelhurst Field, Mineola, Long Island, New York.

First Lieuts. Lawrence B. Loughran, Milton L. Frank, and Charles S. Chase, third, Av. Sec. S. O. R. C., to active duty at Selfridge Field, Mount Clemens, Michigan.

First Lieuts. Adrian M. Butcher, and William W. Nolting, Av. Sec. S. O. R. C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Albert C. Adams, Av. Sec. S. O. R. C., active duty at Hazelhurst Field, Mineola, Long Island, New York.

Extracts From S. O. 239.

Capt. James C. McCoy, Av. Sec. S. O. R. C., rated junior military aeronaut, from July 24th, 1917.

Capt. Arthur Boettcher, Av. Sec. Signal Corps, rated junior military aeronaut, from July 24th, 1917.

Capt. Tolbert F. Hardin, Av. Sec. Signal Corps, rated junior military aeronaut, from August 7, 1917.

First Lieut. Herbert B. Allen, Signal Corps, to Camp Taliaferro, Fort Worth, Texas, for duty.

First Lieut. Charles Thurlow, Jr., Av. Sec. S. O. R. C., active duty, October 22nd, 1917, at Hazelhurst Field, Mineola, Long Island, New York.

The following named officers, Av. Sec. S. O. R. C., active duty at Army Balloon School, Fort Omaha, Nebraska: Capt. Raymond H. Harrell, First Lieut. F. Rosier Wickard, First Lieut. Sidney I. Howell.

First Lieut. Mortimer C. Funston, S. O. R. C., from duty Leon Springs, Texas, to Fort Sam Houston, Texas, for duty with Depot Co. K, Signal Corps, National Army.

First Lieut. Augustine J. Zerbee, Signal Corps, to commanding general of Southern Department for assignment to duty.

Lieut. Col. Archie Miller, (Cavalry), Signal Corps, to Chief Signal Officer of the Army, for duty.

First Lieut. T. Dwight Boole, Av. Sec. S. O. R. C., active duty reporting to the Chief Signal Officer of the Army for assignment.

Capt. Max C. Fleischmann, Av. Sec. S. O. R. C., rated junior military aeronaut, from Sept. 23rd, 1917.

First Lieut. Frank W. Goodale, Av. Sec. S. O. R. C., rated junior military aeronaut from August 8, 1917.

First Lieut. Gordon B. Fulcher, S. O. R. C., active duty at Camp Alfred Vail, Little Silver, New Jersey.

Capt. John A. Kick and First Lieut. George P. Bush, Signal Officers' Reserve Corps, to 91st Division, 405th Telegraph Battalion, American Lake, Washington, for duty.

First Lieuts. Paul C. Wanser, Morgan W. Wickersham, and Robert G. Macks, Av. Sec. S. O. R. C., to Toronto, Canada, reporting to commanding officer, United States Aviation Detachment, for duty.

Capt. Byron B. Daggett, Av. Sec. S. O. R. C., rated junior military aeronaut, from July 24th, 1917.

Major Joseph C. Riley, Av. Sec. Signal Corps, to Washington, D. C., reporting to the Chief Signal Officer of the Army for duty.

First Lieut. Fred A. Post, Av. Sec. S. O. R. C., rated junior military aeronaut, from July 24th, 1917.

Extracts from Special Order 235

Major Lawrence C. Angstrom, Signal Corps, proceed to Ontario, Canada, reporting to the senior officer in person, Signal Corps personnel, Camp Borden, for duty.

Capt. Francis D. Bowne, Av. Sec., S. O. R. C., active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for temporary duty, upon the completion thereof will proceed to Love Field, Dallas, Texas, reporting in person to the commanding officer at that place for duty.

Capts. Theodore L. Bailey and William Menkel, Av. Sec., S. O. R. C., active duty, proceeding to Washington, D. C., reporting to the Chief Signal Officer of the army in person, for assignment to duty.

First Lieuts. John W. Edwards and Paul E. Green, Av. Sec., S. O. R. C., to active duty, reporting in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for assignment to duty.

Major William A. Larned, Av. Sec., S. O. R. C., Signal Corps, relieved from duty as a member of the board of officers appointed by paragraph 47, Special Orders No. 246, October 20, 1916, War Department, to meet in Washington, D. C., for the purpose of examining applicants for commissions in the Aviation Section, Signal Officers' Reserve Corps.

First Lieuts. Thomas H. Farnsworth and William W. Waring, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

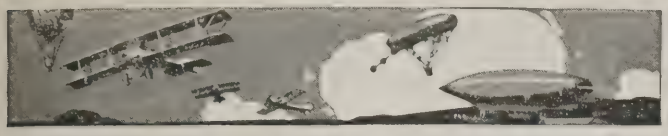
First Lieut. Edgar A. Bryan, Av. Sec., S. O. R. C., is rated a junior military aeronaut, effective September 19, 1917, under the provisions of the Act of Congress approved July 24, 1917.

Capt. E. Roy Morrow, Av. Sec., S. O. R. C., reporting to the commanding general, Central Department, for duty as department aeronautical officer, relieving from that duty Major Ira A. Rader, Signal Corps, who upon being thus relieved will proceed to Hazelhurst Field, Mineola, Long Island, N. Y., reporting to the commanding officer thereof for duty.

First Lieut. Lewis W. Stevens, Av. Sec., S. O. R. C., is relieved from his present duties,

(*Continued on page* 300)

EVERYTHING IN RUBBER FOR AIRPLANES



BALLOONS OF ANY SIZE AND EVERY TYPE

The Goodyear Kite-Balloon

The kite-balloon perfected by Goodyear combines the principles of the man-lifting kite and the captive balloon.

The first was unpractical because it required a strong wind.

The second was unsatisfactory because its use was limited to periods of calm.

Neither was stable, nor free enough from veering and yawing.

The Goodyear type of kite-balloon has fused the operating principles of both, selecting the best in each, so that it serves in storm and calm and furnishes a fixed, unwavering eye for artillery and fleet.

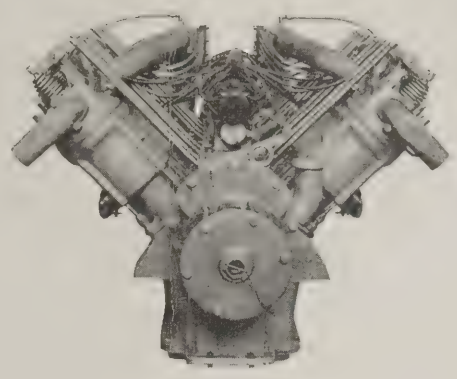
The carefully adjusted inclination of the elongated bag makes the plane of its nether surface a kite when the wind is on its front, and a resistant plane when the air currents are heavy on the back of the bag.

The refinements of keel construction, steadying side fins, and stabilizing tail-cups are Goodyear contributions to steadiness in air.

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(*Continued from page* 298)

and will proceed to Washington, D. C., reporting in person to the Chief Signal Officer for duty.

The board of officers appointed by paragraph 33, Special Orders No. 41, February 19, 1917, War Department, to meet at Mineola, Long Island, N. Y., for the purpose of examining applicants for commissions in the Aviation Section, Signal Officers' Reserve Corps, is dissolved.

A board of officers to consist of Capt. Morgan H. Grace, Av. Sec., S. O. R. C., and First Lieut. Grover C. Otrich, Medical Reserve Corps, is appointed to meet at New York, N. Y., for the purpose of examining applicants for commissions in the Aviation Section, Signal Officers' Reserve Corps.

First Lieut. Claude H. deLorraine, Signal Corps, reporting in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

Previous orders announcing First Lieut. John Dentworth, Av. Sec., S. O. R. C., as on duty requiring him to participate regularly and frequently in aerial flights from September 22, 1917, are amended so as to read First Lieut. John Wentworth, Av. Sec., S. O. R. C.

Majors William H. Wilmer and Edward G. Seibert, Medical Reserve Corps, will proceed to Langley Field, Hampton, Virginia, for temporary duty in connection with aviation, upon completion of which will return to their proper stations.

Capt. Albert B. Lambert, Signal Corps, is relieved from duty and will proceed to St. Louis, Mo., and assume command of the Balloon School of the Missouri Aeronautical Society.

A board to consist of Lieut. Col. M. C. Bristol, Signal Corps; Lieut. Col. W. H. Hutton, Jr., Signal Corps; Major J. G. Vincent, Signal Corps; Capt. F. C. Bahr, Signal Corps; First Lieut. Arthur C. Walser, Av. Sec., S. O. R. C.; Dr. W. W. Stockberger, Department of Agriculture; Prof. K. Zimmerschief, on duty in the office of the Chief Signal Officer; Dr. A. F. Taylor, Export Board; Mr. F. C. Pederson, Export Board; and Mr. C. T. Bush, on duty in the office of the Chief Signal Officer, is appointed to meet in this city at the call of the senior member of the board for the purpose of investigating, reporting upon and making recommendations concerning the castor oil situation.

First Lieut. George C. Kull, Av. Sec., S. O. R. C., will proceed to Love Field, Dallas, Tex., reporting to the commanding officer in person for duty on or about November 10, 1917.

First Lieut. William J. Jacobi, Av. Sec., S. O. R. C., and First Lieut. Adelbert Ames, Jr., Signal Corps, are relieved from duty, proceeding to Langley Field, Hampton, Va., reporting in person to the commanding officer at that place for duty in connection with aviation photography.

Special Orders No. 237

Corpl. Callan T. Albritton, general service, infantry recruiting station, 508 Post Office Building, Atlanta, Ga., is transferred as of this present grade to the Aviation Section, Signal Corps, and will be sent to the general supply depot, Washington, D. C., for duty.

First Lieuts. Harry P. Warren and Roger S. McCullough, Av. Sec., S. O. R. C., to active duty, proceeding to Fort Omaha, Neb., reporting in person to the commanding officer, Army Balloon School, for assignment to duty.

First Lieut. Charles H. Vanderpool, Av. Sec., S. O. R. C., to active duty, proceeding to Middletown, Pa, reporting in person to the commanding officer, Signal Corps General Supply Depot, for duty.

First Lieut. Lafayette Wilson, Av. Sec., S. O. R. C., to active duty, reporting in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

Paragraph 129, Special Orders No. 226, War Department, September 28, 1917, relating to First Lieut. John H. Jouett, Av. Sec., S. O. R. C., is amended to read as follows: First Lieut. John H. Jouett, Av. Sec., Signal Corps, is relieved from duty requiring him to participate regularly and frequently in aerial flights from September 19, 1917.

First Lieuts. William T. Campbell, Kenneth L. Moore and Thomas J. Hilliard, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer in person, Wilbur Wright Field, Fairfield, Ohio, for duty.

Capt. Henry E. Holt, Av. Sec., S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for duty

Sergt. W. F. Damesyn, Av. Sec., S. O. R. C., Camp Kelly, South San Antonio, Tex., will be sent to New Haven, Conn, for temporary duty as non-commissioned officer in charge of detachment now at the Marlin-Rockwell Machine Gun Corporation, that city. The Quartermaster Corps will pay the soldier's commutation, rations and quarters at the prescribed rate during the time he is on such duty.

First Lieut. Theodore P. Walker, Signal Corps, proceeding to San Antonio, Tex., reporting to the commanding officer, Kelly Field, for duty.

First Lieut. Alexander R. Stevenson, Av. Sec., S. O. R. C., from duty, proceeding to Washington, D. C., reporting to the Chief Signal Officer of the army for duty.

Orders heretofore issued relieving First Lieut. Walter R. Gehan, Av. Sec., S. O. R. C., from duty at Camp Kelly, South San Antonio, Tex., and directing him to proceed to Park Field, Millington, Tenn., reporting to the commanding officer, Signal Corps, Av. Sec., for duty not later than October 27, 1917, are revoked.

First Lieut. Walter R. Gehan, Av. Sec., S. O. R. C., will proceed to Washington, D. C., reporting to the Chief Signal Officer of the army for duty.

Capt. Edward P. Beverley, Medical Reserve Corps, relieved from duty at Balboa, Canal Zone, proceeding to Mineola, Long Island, N. Y., reporting in person to the commanding officer for duty with the Aviation Section, Signal Corps, United States Army, and by letter to the commanding general, Av. Sec., Signal Corps, 119 D. Street, N. E., Washington, D. C.

First Lieut. George Brown, Jr., Av. Sec., S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for duty.

Capt. George W. Price, Signal Corps, proceeding to South San Antonio, Tex., reporting to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.

Paragraph 138, Special Orders No. 229, War Department, October 2, 1917, relating to Capt. A. L. Loening, Av. Sec., S. O. R. C., is amended to read: Capt. Albert P. Loening, Av. Sec., Signal Officers, Reserve Corps.

First Lieut. Lewis W. Stevens, Av. Sec., S. O. R. C., relieved from duty, proceeding to Langley Field, Hampton, Va., reporting to the commanding officer for duty.

Capt. Albert D. Smith, S. O. R. C., to Dayton, Ohio, reporting to the commanding officer, McCook Field, for duty.

Special Orders No. 238

Lieut. Col. Lawrence C. Brown, Signal Corps, proceeding to Mineola, Long Island, N. Y., reporting in person to the commanding officer, Hazelhurst Field, for duty.

First Lieut. Hubert E. Baxter, Signal Corps, reporting to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

First Lieut. James D. Paul, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, Chandler Field, Essington, Pa., for duty.

AERIAL AGE WEEKLY

Vol. 6, No. 8 NOVEMBER 5, 1917 10 CENTS A COPY



Heavy, Heavy, What Hangs Over Your Head!

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Aircraft Corporation

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THE TRADE AUTHORITY

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ALL POSSIBLE HASTE URGED BY AMERICANS IN FRANCE IN CARRYING OUT OUR AERONAUTIC PROGRAM

THE Aero Club of America has received from its Foreign Service Committee in Paris a copy of the following resolution adopted by a group of Americans, including a number of newspaper correspondents, who attended a dinner given in honor of Ambassador William G. Sharp:

"We, the undersigned citizens of the United States, assembled in Paris—correspondents, trained observers at the front, and other visitors—having made careful note of the situation on and behind the battle lines, unite in this message of good cheer to our fellow countrymen.

"First: Our soldiers now in camp on this side and constantly arriving are of a quality which has won the admiration of our allies. Good judges say that it is unexcelled on either side of the long battle lines. We are glad to make good report of the excellent spirit of the men and of the progress of their training.

"Second: We feel that it should be understood at home that while the losses of the war are very great the numbers engaged are beyond all precedent and that, relatively, the proportion of loss is probably not above that of other wars.

"Third: Seen from this side, the courage, activity and effectiveness of our sea forces in assisting the work of the British navy has been most impressive.

"Fourth:
(FOLLOWING IN B F—
We find that the magnitude and thoroughness of our preparation for aerial warfare is regarded here as likely to be one of the most decisive factors in the war. We urge all possible haste.

"Fifth: We find a high, inflexible morale in the troops and people of our great allies. France has got her second wind and nowhere in the French Republic may one discover a sign of weakness or faltering. Britain, conscious of her strength and well within it, stands firm and united for any sacrifice that victory may demand. In both countries, rich and poor, men and women, are cheerfully at work for the common cause. The spirit of Italy is equally high and determined.

"Sixth: We condemn the spirit with which Germany has made war upon her western neighbors. We recognize that such destruction and deplorable violence to those who have no share in the fighting may be regarded as a part of the business of war. But the deliberate wrecking, by dynamite, of cities without strategic importance, where noble edifices and the humblest houses of the poor are, one by one, shaken down; the carrying into captivity of the daughters of whole communities—these are crimes of which our own eyes and ears have had abundant proof and of which we find it difficult to express ourselves with becoming restraint.

"Seventh: We agree with our President that a government capable of such a misuse of power must be deprived of it and that nothing less than its overthrow is consistent with the safety of our institutions or a decent regard for posterity.

"Eighth: At the front there are many signs of the weakening of the enemy, who is, it cannot be doubted, eager for peace, but as yet unable to realize the nature of the only terms upon which it can be secured.

"Ninth: We have unbounded faith in the loyalty of our people to the form of government under which they have enjoyed a degree of happiness and prosperity and an encouragement of aspiration the like of which is not elsewhere to be found. But we desire to warn them that every word spoken in our land which can be distorted into a semblance of disloyalty or into willingness for an indecisive peace will quickly find its way to Berlin, there to be misinterpreted and scattered abroad as evidence of dissension among us. We believe that such words have the effect of prolonging the war and increasing its sacrifices."

Among those present at the dinner were: Ambassador Sharp, Irving Batchelder, Paul Van Dyke, Reginald Kauffman, Warrington Dawson, Augustus Post, Honorary Secretary of the Aero Club of America; Francis M. Mansfield, Milton Snyder, Luciert Bonheur, J. Caillaux, H. S. Wales, Jr., Joseph C. Green, Cecil T. Dorman, Stoddard Dewey, Frederick S. Hopper, Eva T. Wilson, Gertrude Lynch, John Milton Erwin, Ruth Kauffman, Aurelia Bonheur, B. D. Evans, Josiah M. Ward.

SIR DAVID HENDERSON LAUDS AMERICAN AERIAL PROGRAM

MAJOR GENERAL SIR DAVID HENDERSON, who is retiring as head of the British Air Board to undertake an important "special duty," in an interview with the Associated Press praised the American war program but warned against the danger of overdoing standardization in aircraft. He expressed the belief that the American public should be prepared for "fairly severe" losses in air training.

In connection with the American air program, Sir David's only anxiety is that the American plans for the future shall not be permitted to hinder the present work of the British air service, which is depending to a considerable extent on materials and training machines ordered in the United States.

"I shall not say much to you about the plans of the British air service for the immediate future," Sir David said. "That would be giving information that the enemy is very anxious to obtain. The Germans are acutely alarmed over the preparations that the Entente Allies are making for the air war next year. They are under no illusions about it and they are bending every effort to counter it by a stupendous program on their own side. But we have had the upper hand of them in the air from the very beginning and feel sure, especially with the help of the United States, that our mastery will grow stronger notwithstanding all their efforts.

"The British Flying Corps is from seventy to a hundred times larger today than at the start of the war, and we have made this tremendous augmentation at the same time that we have been carrying on a war that involved heavy losses and continual replacement from the very first day.

"There are certain aeroplane materials for which we are absolutely dependent upon the United States, such as spruce. Both in this and some other materials the world's supply is so limited that we shall all have to be content, at least partly,

with substitutes. Your Production Board no doubt is watching all these questions closely and will distribute the materials to the best advantage of all the Allies.

"Take, for instance, the question of training machines, of which we have been getting a fairly regular supply from the United States. It is very necessary that we should continue to get these machines for training our pilots, and any check in the supply would seriously hamper our production of pilots for the spring offensive.

Praises American Engine

"I have seen only the plans of the new American aeroplane engine, but it looks extraordinarily good. It may have small 'teething troubles,' but I think you may rest assured you have a sound power plant basis.

"As to the production of a standard type aeroplane, there still is some difference of opinion. Certainly there is great danger in overstandardization. If you want the best type you must be continually improving and changing. The question the air commander must ask is, How long can you afford to go on with a particular type of machine, and whether it is likely soon to be superseded by a better type, developed either by ourselves or the enemy?

"The Germans have been fairly successful with a policy that involves the standardization of engines and frequent changes in planes. The Germans had a certain advantage over the British at the start because they already had two good types of water cooled engines. We started with French engines, but now have our own, and they are admittedly far superior to anything the Germans ever produced. In aeroplane design we always have been better than the enemy, but in the early days of the war we were at a disadvantage because our planes were underengined."

Explains Increased Casualties

Asked whether it were true that the British casualties in air training had increased considerably in recent months, Sir David said:

"The total number of our training casualties increased heavily, but that was mainly because so many more men were training. It must be admitted, however, that the actual percentage of casualties in training also increased slightly owing to the fact that our training has grown so much more comprehensive.

"Looping the loop has come to be almost a kindergarten exercise in air training, and the man training to be a fighting pilot must practice the side slip, the tail slide, the nose dive and other aeronautics of a most complicated character until he is able to do almost anything with his machine.

Predicts "Fairly Severe" Losses

"Your casualties in the United States are likely to be fairly severe, because you have not skilled instructors in sufficient numbers. We sent back to you a number of good men, especially some very valuable Americans who had been in the British flying corps, but it was impossible to spare the large numbers which are desirable for the big plans which you have under way.

"Actual experience is most valuable training for the airman," Sir David concluded. "No bravery or native skill can compensate for a lack of experience and training in actual war. The best airmen in the British Army, speaking generally, are those who have been at it the longest. For instance, one of our squadrons contains eighteen men who have downed two hundred enemy machines in six months and won a victory over that superb German airman the late Lieutenant Vosse. The leaders of that squadron are men who have had long experience at the game. They are just as daring as anybody, but they have learned by that very experience how best to protect themselves while inflicting the greatest damage on the enemy."

AMERICA AND ITALY IN THE AIR

(Editorial in New York World)

LIEUT. BALDIOLI'S scout-plane made 330 miles Monday in 175 minutes. Lieut. Resnati covered the same distance with his second-size Caproni in 265 minutes. To make nearly the same trip from New York to Old Point, ordinary trains take twelve hours and steamships eighteen and more.

Planes even faster than Baldioli's are in action, but they are for machine-gun fighting purely, are very small and cannot ordinarily fly at night. Baldioli's carries 390 pounds of bombs at an extreme speed of two miles in a minute. The smaller Caproni bore pilot, two mechanicians and six passengers. She could carry half a ton of bombs, according to distance; the largest Caproni two or three tons.

From points behind the American front in France a return-trip distance of 300 miles would bring within the range of air action almost every ammunition dump, railroad junction, bridge, factory and camp in occupied France and Belgium, and many in Germany. Bombs rivalling in explosive force the giant shells that wrecked the forts at Liége may be whisked through the air at eighty miles an hour, and smaller ones faster.

The surface of land and sea is strewn with fighting men; they have dived and burrowed beneath the surfaces in submarines and bomb-proofs. The air is conquered; it is not yet fully occupied. Conviction grows that the way to end the slaughter of nations is to occupy the air and blow German militarism out of its dug-outs. To that end, Italy is doing her splendid share and the United States is eagerly preparing.

BUILDING THE AEROPLANE FLEET

(Editorial in the New York Times)

IN an interview in London Major General Sir David Henderson, for some time head of the British Air Board, warns the United States against what may be termed excess of standardization in aeroplane construction. This is a knotty problem. Without a good deal of standardization of parts it would be impossible to turn out thousands of aeroplanes and keep them in repair. On the other hand, evolution in design has been so rapid in Europe since the war began that each new terror of the air was soon consigned to the scrap heap, or withdrawn for the training of novices. With Taubes and Fokkers the Germans ruled the skies for a while, but vastly improved machines are now fighting for supremacy in the air on the western front. For war purposes the aeroplanes with which the European combatants began the struggle are now archaic.

Perhaps it is because British construction has always been in a state of transition and experiment that General Henderson looks with misgiving upon standardization on any large scale. Certain it is that the British, who entered the war with eighty aeroplanes, none of which could fly faster than as many miles in an hour, have performed almost a miracle in developing their air service. The Royal Flying Corps did, indeed, save Sir John French's expeditionary army in the retreat from Mons by vigilant and tireless reconnaissance; but at the outbreak of war the Germans could show at least seven machines for every one the British had, and the German superiority in personnel was overwhelming. By the time the battle of the Somme opened, July 1, 1916, the British had won in the stern chase, which seemed like a forlorn hope, and in that long drawn out offensive they drove the Germans from the air above the fighting line. Today the British still have an advantage in spite of the swagger of the German monthly bulletins. Like ourselves, the British had to begin by designing the right kind of motor. Originally they used a French engine and a German magneto. The fact of the matter is, they had precious little time for standardization as a system.

Still, as has been said, standardization is essential to the American plan of the most efficient aeroplane navy in the world; but it must not be carried to an extreme. American inventiveness should be able to master the problem of progressive standardization. That expression describes the policy of the Germans, who have had remarkable success with their engines. But as improvements are made the Americans should be ready to restandardize. We must have the most powerful engines and the latest planes that money can buy. With considerably more than half a billion to spend on the air service we will excel in it.

An unchallengeable supremacy in fighting and bombing machines wins the war; still, we must not let the grass grow under our feet. Only the other day General George O. Squier, Chief Signal Officer of the Army, advertised for 100,000 machinists, electricians, carpenters, and gasoline engine men. They are wanted in the aviation section of the Signal Corps to keep the army aeroplanes in repair. The incident is suggestive. We haven't as yet the aeroplanes to keep in repair, but only a nucleus. There is a vast amount of work to be done before the American manufacturers are fairly started on their record-breaking enterprise. A good beginning has been made with the Liberty motor. It may not be the best in the world—General Henderson, indeed, hints at "teething troubles"—but if the Liberty needs improvements they will follow fast. Perhaps it is not extravagant to say that in a few months we shall be turning out aeroplanes faster than our aviators can "assimilate" them.



THE NEWS OF THE WEEK



Aviators Play Important Part in Liberty Bond Parade

That dream of the fictionists—an aeroplane at your office window or on your office building roof—looked mighty close to realization on the afternoon of the Liberty Bond Parade in New York City.

For right by the windows of the Woolworth Tower, and of the Metropolitan Tower, directly past the highest stories of the Municipal Building down by the Brooklyn Bridge, sped the largest machine New York has ever seen—the triple-motored Italian Caproni of 550 horsepower, driven by Capt. Antonio Silvio Resnati.

Capt. Resnati, carrying as passengers Gen. Emilio Guglielmotti, the Italian Military Attache, and Lieut. C. Patti, flew from Mineola, L. I., to drop upon the city, and especially upon the Liberty Loan parade, paper bombs advising the purchase of bonds. Up from the Long Island field came Lieut. Atillio Baldioli, with Major J. W. Butts, U. S. A., for the same purpose, in a faster-going Pomilio scout machine. Both dropped many thousand circulars, which hundreds of thousands of New Yorkers scrambled for.

Leaving Mineola at 2.45, the Caproni machine climbed to about 4,000 feet and headed across the East River for Central Park. It circled two or three times above the sheep meadow, where rests the U-Buy-a-Bond, and then it proceeded with apparent leisure (although it was in reality moving about seventy-five miles an hour) diagonally across the Park and down Fifth avenue, upon which thoroughfare the Liberty Loan paraders were proceeding northward.

Nearing the reviewing stand at 23d street, the machine swung slightly west and dropped an immense bundle of circulars. Then it swerved east, circled the Metropolitan Tower twice (below the top of the tower) and once more moved straight down the avenue so low that some of the paraders and spectators were frightened, even as they shouted aloft their admiration.

"I think we were only about 200 yards above the crowds," Capt. Resnati said later at Mineola. "I could hear their cheers very distinctly and could almost distinguish faces."

Departing from the city at 3.35, the giant plane made a low swoop over Governor's Island and then returned to Mineola.

The Pomilio scout also put up quite a performance, giving a splendid exhibition of speed—sometimes traveling two miles a minute or more—and of aerial antics, such as steep banking, spiralling and diving.

This machine's pilot did by far the prettiest bombing." Noticing that the first lot of circulars dropped by the Caproni were swept by the wind far to the east of Fifth avenue, Lieut. Baldioli took his machine far to the westward—over by Eighth or Ninth avenue it looked—and there let go his "bomb." His calculation was exact. The wind carried the fluttering papers eastward and dropped them right upon the reviewing stand and upon the thousands of paraders. Nor was this a lucky fluke. After he had sped over the crowd, following this feat, he took his machine back westward again and let go another parcel of circulars, which hit the mark a second time. It was pretty work.

The Pomilio scout dropped in upon Governor's Island after its work was over, and left Major Butts there in time for dinner. Then it breezed down to Mineola at two miles a minute.

Three Army Men to Lose Places on Aircraft Board

Three Army men, now members of the Aircraft Production Board of the National Council of Defense, are to lose their posts when the President appoints the new Aircraft Board.

The President is expected to appoint three Army men, three Navy men and three civilians as members of the board immediately. Secretaries Baker and Daniels have recommended the Army and Navy members, and the names of several aircraft experts are now before the President for selection as the civilian members, one of whom will serve as chairman.

The Aircraft Production Board, as now constituted includes six Army men, two from the Navy, and Howard Coffin, the civilian chairman. It is expected that Mr. Coffin will be reappointed. The law provides that the Chief Signal Officer, Major General George O. Squier, of the Army, and Chief of the Bureau of Naval Construction and Repairs, Rear Admiral David W. Taylor, shall be members. This leaves two Army, two Navy and three civilians to be selected for membership.



Twin motored Caproni biplane which displayed a picturesque and important part in the Liberty Bond Day Parade in New York City.

Breaks Endurance Record

The same motor, a preliminary government test of which took place in San Francisco last May, has just succeeded in establishing what might be called a world's endurance record at the Aeronautical Testing Laboratory, U. S. Navy Yard, Washington, D. C. The best previous record at the government laboratory of either European or American engines was under thirty-six hours. It is thus seen that the new record of fifty-four hours, established by the Union aeromotor far exceeds the performance of the best known motors of the world.

It is certainly gratifying to know that this record was established by an American-made motor, especially when it is recalled that only a little over a year ago our Government experts stated that Europe was far ahead of America in the design of aeroplane engines. This record together with the remarkable success of the Liberty motor leaves no doubt as to our ability to compete with European talent.

Little has been learned of this test on account of strict censorship, but it is known that the motor was in excellent condition when, due to the failure of a gasket in the lubricating system, it was deemed advisable to discontinue the run. The motor was shut down and dismantled for inspection.



The Caproni biplane flying over the "U-Buy-A-Bond" in Central Park, New York City.

Army Seeks 20,000 Airmen

Efforts are being made at the headquarters of the Eastern Department to speed up the rate of enlistments in the aviation service. Twenty thousand men are needed to man the great air fleet which the War Department intends to send to Europe, and only one-tenth of that number has been recruited thus far. Although the flying corps attracts many applicants before the examining board each day, the physical and mental requirements are exacting and fully 50 per cent of the applications received are rejected.

An official in charge of recruiting for the aviation section said the examination was a scientific one, calculated solely to ascertain the applicant's physical condition and his powers of endurance. Absolutely perfect eyesight was required. In all other respects, however, the examination was one which any man in excellent physical condition could pass, provided he met the requirements as to height and weight.

Candidates for commissions as flying officers in the aviation section must be at least 19 years old and preferably not more than 30 although in exceptional cases older men of pronounced athletic attainments who have spent most of their lives out of doors, in the saddle, ranching, etc., may be accepted if they can satisfy the Examining Board of their physical fitness. Applicants will not be recommended who are not in every way qualified and fitted to become officers of the United States Army.

All candidates are enlisted in the Signal Corps or the Signal Enlisted Reserve Corps. This service will actually hold them for the period of training which covers the course at the schools of military aeronautics (ground schools) and at the aviation or flying school up to the time when, having passed the tests for the reserve military aviator or juinor military aviator as required by the Chief Signal Officer, they are commissioned. If they fail they will be discharged from the Signal Corps and revert to their former status. Failure to qualify for a commission will not exempt from the draft law.

Captain Robert D. Bartlett Makes First Flight

Captain Robert A. Bartlett, the famous explorer, commander of the Macmillan Relief Expedition, who was Captain of the ship "Roosevelt" in both of the Peary Expeditions, made his first flight today on the Italian Pomilio speed scout piloted by Lieut. Attilio Baldioli.

Captain Bartlett was one of a party which motored to the Mineola Aviation Field on October 27 to make flights on the invitation of the Italian officers. The party included Captain Bartlett, Russell Hastings Millward, the explorer, Major C. C. Culver, in charge of the Radio Division of the U. S. Army Air Service, and Mrs. Culver Henry Woodhouse, member of the Board of Governors of the Aero Club of America, and William Dubilier, the wireless expert.

The first flight with Lieut. Baldioli in the fast hour Pomilio fighting plane was made by Mr. Woodhouse, after which Captain Thomas Hitchcock of the U. S. Army Air Service went up and looped-the-loop and tail-slipped a number of times with Lieut. Baldioli. Then Captain Bartlett was taken for his flight.

Captain Bartlett was most enthusiastic. On landing, his first expression was "No more ships for me! With a machine like this I can do in an hour what takes six months with a ship. I can find out in no time whether there is land in the unexplored arctic region, and bring back a snap-shot of the land at the first trip, which may not take more than a few hours."

Airmen Drop Letters

The Liberty Loan airmen, Caleb Bragg, holder of the American altitude record, and Philip Boyer, spread loan literature over eight towns of the Hudson River Valley on their flight to Troy from Port Washington, L. I., making the trip without mishap. Stopping long enough in Troy to deliver their message personally to the loan organization of that city, the airmen began the trip back to their station, completing the return flight in two hours.

The letters dropped from the plane contained congratulations of Gov. Strong of the Federal Reserve Bank on the energetic campaign waged along the Hudson. The flight up the river required three hours. The machine used was an F. B. A. Flying Boat with a Hispano-Suiza motor.

American Aviator Wins First Fight

Lenox.—George E. Turnure, Jr., who has been training in France for aviation service, has brought down his first German aeroplane, according to cables received by Major and Mrs. George Evans Turnure.

Willys Plans War Recreation Campaign

Washington.—John N. Willys, who is giving his services to War Camp Community Recreation, was chairman of a meeting attended by representatives from all parts of the country, which was held in Washington, beginning October 23, at which plans for a campaign for furnishing leisure hour entertainment for soldiers were made. The national committee, with Mr. Willys as chairman, will direct the work decided upon.

Cleveland S. A. E. Opens Session

Cleveland.—At the meeting of the Cleveland Section of the Society of Automotive Engineers held October 19, E. H. Sherbondy, research engineer in the Government aeroplane engine service, and Alfred Harris, a Cleveland business man and amateur aviator, spoke on aviation topics. It was originally planned and announced that a noted French aviator would address the meeting on conditions at the French front as regards the aircraft service. This aviator was to be Captain De la Grange, who addressed the last summer session of the Society of Automotive Engineers in Washington. Owing to the fact that orders reached the captain which necessitated his being elsewhere that evening, the program could not be carried out, and Messrs. Sherbondy and Harris addressed the meeting extemporaneously on aircraft subjects.

Sherbondy took up the discussion of the type of aeroplanes now in use in all the principal countries, showing lantern slides of a large number of these and explaining the points of interest regarding each. He showed the different engine arrangements and points of difference in other features of the allied and German aircraft.

In speaking of the fuels used by aeroplanes, Sherbondy stated that these must be more volatile than the fuels used for automobile purposes and should have an end point not exceeding 250 deg.

Alfred Harris, in speaking of the aviator's point of view of his machine, stated that no one appreciates the value so much as the one who flies. He spoke of the desirability of having an ample reserve power factor for machines regardless of weight, because the machine having the highest power is the safest due to the increase in the safety factor with increased speed.

Wright-Martin Gets Government Order

New York.—According to a despatch in *The Automobile* the Wright-Martin Aircraft Corp. has received an order from the United States Government for 500 150-h.p. and 4,000 220-h.p. Hispano-Suiza aeroplane motors. The company is at present manufacturing this type of motor for the French Government under license. The order for 450 of these motors placed by the French Government two years ago has not yet been completed, but it is expected that it will be finished by the end of this month, when the company can turn its attention to the United States Governments initial order for the 150-h.p. motors.

Albert Medal for Orville Wright

Orville Wright has been honored by Lord Northcliffe, head of the British War Mission to the United States, who decorated him with the Albert Medal. The medal was presented by the Royal Society of the Arts of England, which awards a medal each year to some one of prominence in the arts and sciences of the world. Lord Northcliffe, a director in the society, was designated to make the formal presentation.



Flight Lieut. W. K. Denham, R.N., with one of the student observers at the Plattsburg Camp.

Catalogs for Spanish-American Trade

The Sperry Gyroscope Company, of Brooklyn, are perhaps pioneers in the aeronautical field in the matter of issuing two special catalogs in Spanish describing their special aeronautical instruments. One is entitled "Compases Magneticos para Aeronaves," and describes the magnetic compass; the other "Aparatos Auxiliaries del Piloto Aviador," and tells of the many instruments this company has produced for the greater safety of aviation, and the comfort of the pilot.

Lawson Leases Field

The Lawson Aircraft Company has secured a lease on a 100-acre tract of land at Green Bay City, Wisconsin, where it is expected to build a factory and organize a large school for spring activies.

Chance in Signal Corps

Men subject to the second call to the National Army are to be given an opportunity to study for work in the Army Signal Corps.

The federal board for vocational education has planned to use every school in the country that can be equipped for that work. Volunteer selectmen will be assigned to schools in their towns or districts.

Radio and telegraphing will be taught in night courses. A call has been sent to all citizens properly qualified to serve as teachers, and it is hoped to have the schools in operation in the near future. The first call is for the training of 15,000 operators.

Officials of the vocational board intimated that the mobilization of the schools for the training of men of this class of work is but the first step in a nation-wide scheme of vocational training designed to meet the urgent war needs of both the Army and of industry.

Successful Test of New Aeroplane Control

An aeroplane invention of Deshler Warner, Columbus, who has been living in Dayton and flying with Charles Reinhart for several months, may find its way into the War Department and perhaps into France with the American fliers if subsequent tests prove as good as that given it recently, when Lieutenant Robert Schroeder, adjutant to Major Maxwell Kirby, at the Rantoul, Ill., aviation field, flew several hundred miles in the face of a 40-mile gale and a drizzling rain, using the invention.

The invention is known as the Warner aeroplane control and saves the pilot the use of his hands in balancing, raising or lowering his plane. With the control the pilot may do all of this with his knees.

So far as is known there is no other similar invention in existence. The use of this by army aviators can be readily seen when it is considered that many times the pilots must throw bombs over the trenches, use fire extinguishers and perform various other feats, causing them to release the steering gear. At present all army aviators are forced to use at least one hand in controlling their planes.

Aerial Express Service

A significant step in the aerial transportation field was taken last week when regular train service proved inadequate and a motion-picture company impressed an aeroplane to make a record-breaking delivery of a moving picture film to one of its exhibitors. The flight marks the distinct realization of a dream which until recently was flouted as entirely too visionary for the serious consideration of practical business men.

The Triangle Distributing Corporation's film exchange at Buffalo, N. Y., of which H. E. Lotz is the enterprising manager, was responsible for what is probably the first successful utilization of air service for purely commercial carrying, and furnished the first case where a moving-picture concern is known to have surmounted the difficulties of the present express situation in such a spectacular manner. Various experiments have been conducted, notably by the Washington postal authorities and a Baltimore newspaper, to prove the practicability of the winged carrier, but the Triangle exploit is the first bona-fide shipment of actual merchandise on record.

The seventy miles between Buffalo and Rochester were covered by a 90 h.p. Curtiss biplane tractor in forty-five minutes, while the manager of the Victoria Theatre in Rochester held his audience by announcing that the five reel feature picture advertised for that afternoon had been delayed but was on its way by areoplane.

The flight was made by Roland Rohlfs, son of Anna Katharine Green, the novelist, and an instructor at the Curtiss school who is training pilots for the Government aircraft. He left the Curtiss grounds between Buffalo and Tonawanda at 2.55 o'clock and landed in a wheat field a few miles out of Rochester at exactly 3.40, where the theatre manager and his party received the films and rushed them to the city.

Miss Dunning Bride of Lieut. Salmon, Aviator

More than thirty aviators and other military men were present at the home of Clifford A. Lunning in Glen Cove, L. I., when his sister, Miss Ruth E. Dunning, was married to Lieut. Hamilton N. Salmon, Jr., of the Aviation Corps. The ceremony was performed by the Rev. Dr. F. M. Townley, of St. Bartholomew's, Brooklyn. The bride had no attendants. Lieut. Salmon was attended by Lieut. William Willets, of the Aviation Corps. After a week spent in the South the bridal pair will return to Mineola, where the Lieutenant is to resume his work as aviation instructor.

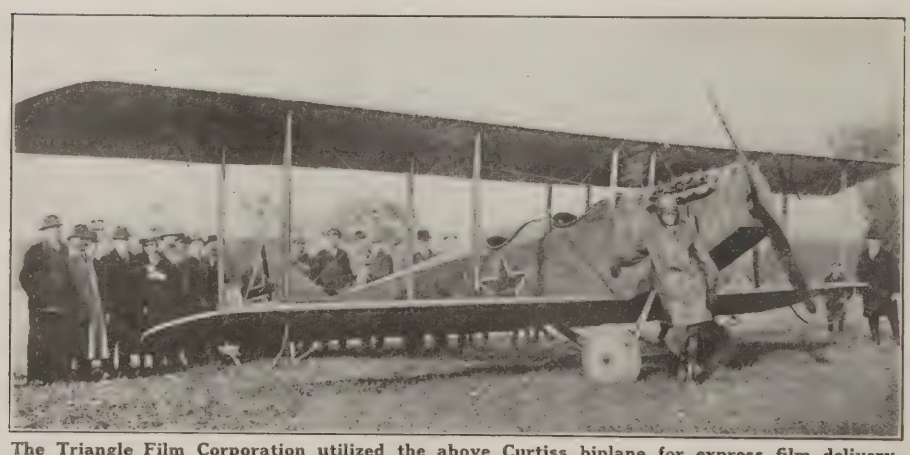
Confirm Death of American Aviator

Paris, Oct. 24.—The reports of the death of Samuel W. Skinner of Cincinnati, who was attached to the French Aviation Corps, were confirmed officially.

Aero Private Purchases 604 Liberty Bonds

San Antonio, Tex., Oct. 22.—Private Lewis A. Ripley, 121st Aero Squadron, at Kelly Field, purchased today from officers in charge of the Liberty Loan campaign 604 $50 Liberty Bonds.

The officers expressed considerable surprise at the size of the order and also the unusual number purchased, so Ripley explained: "I have just sold my seat on the New York Stock Exchange for $30,200 and the bonds are the best investment I know of."



The Triangle Film Corporation utilized the above Curtiss biplane for express film delivery service between Buffalo and Rochester recently during a temporary interruption of train service

NAVAL and MILITARY AERONAUTICS

Notes of Chanute Field, Rantoul

Lieut. Harold N. Schroeder, who is stationed at the Chanute aviation field at Rantoul, Ill., made thirty-eight loops in succession before a crowd of 200,000 persons at the big Liberty Loan meeting in Chicago, Oct. 21. The Rantoul aviators were sent to Chicago to bomb that city in the interests of the second issue of the Liberty Loan, two planes being used for the trip. One of the machines contained Major C. C. Benedict and Capt. Maurice Connolly, while the other contained Major A. H. Gilkeson and Lieut. Harold Schroeder.

Sergeant Marquis Rice of Watertown, N. Y., has a charmed life. He fell almost four hundred feet at the Chanute aviation field at Rantoul, Ill., recently and was only slightly injured.

It has been announced that the aviation ground school at the University of Illinois at Urbana, Ill., is to be enlarged. The university trustees have announced that the new woman's dormitory will be turned over for the use of the aviation students.

Lieut. Col. Frederick M. Jones, the new commander of the Chanute aviation field at Rantoul, has been in the service of the United States Army for the past thirty-two years. His first service was with the Seventh Cavalry in Dakota, being with that regiment when it marched to the Indian Territory. The colonel has had two tours in the Phillipines and has had extensive service with the Signal Corps at Santiago, Cuba and Porto Rico. Before coming to Chanute Field, Colonel Jones was with the Seventh Cavalry on the Mexican border.

Special Order 236

Capt. Charles E. Merriam, Av. Sec., S. O. R. C., to active duty, reporting in person to the commanding general, Central Department, Chicago, Ill., for assignment to duty.

First Lieut. Harry C. Ferguson, Av. Sec., S. O. R. C., is assigned to active duty, reporting to the commanding officer in person, Hazelhurst Field, Mineola, Long Island, N. Y., for assignment to duty.

Capts. George F. Campbell and Frederick Libbey, Signal Corps, reporting to the senior, Signal Corps personnel, United States Army, Camp Borden, Ontario, Canada, for duty.

Capt. William P. Kelleher, Signal Corps, reporting in person to the commanding officer, Camp Kelly, San Antonio, Tex., for assignment to duty.

First Lieut. Winthrop P. Butterick, Av. Sec., S. O. R. C., to active duty, proceeding to Hampton, Va., reporting in person to the commanding officer, Langley Field, for assignment to duty.

Major Byron O. Jones, junior military aviator, Signal Corps, is rated as a military aviator from September 27, 1917.

First Lieut. Otto E. Strahlman, Av. Sec., S. O. R. C., proceeding to McCook Field, Dayton, Ohio, reporting in person to the commanding officer at that place for duty.

Orders heretofore issued directing First Lieut. George C. Kull, Av. Sec., S. O. R. C., to proceed to Love Field, Dallas, Tex., reporting to the commanding officer for duty are revoked

First Lieut. Orrin E. Wolfe, Av. Sec., S. O. R. C., to active duty, reporting in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, New York, for assignment to duty.

First Lieut. Stafford G. de Les Dernier, Av. Sec., S. O. R. C., to active duty at Middletown, Pa., reporting in person to the commanding officer, Signal Corps, general supply depot, that place, for assignment to duty.

Capt. Charles E. Merriam, Av. Sec., S. O. R. C., is detailed as a member of the board of officers appointed by paragraph 17, Special Orders No. 98, War Department, April 28, 1917, to meet at Chicago, Ill., for the purpose of examining applicants for commissions in the Aviation Section, S. O. R. C., vice Major Ira A. Rader, junior military aviator, Signal Corps, hereby relieved.

First Lieut. Gordon Baker, Signal Corps, reporting to the commanding officer Chandler Field, Essington, Pa., for duty.

Corpl. Lindley Weedon, 16th Aero Squadron, Signal Corps, Chanute Field, Rantoul, Ill., is relieved from duty requiring him to participate regularly and frequently in aerial flights from and including September 4, 1917.

A board of officers to consist of Capt. Abraham L. Labine, Av. Sec., S. O. R. C., and Capt. Charles S. Butler, Medical Reserve Corps, is appointed to meet at Boston, Mass, for the purpose of examining applicants for commissions in the Aviation Section, Signal Officers' Reserve Corps.

So much of paragraph 155, Special Order No. 222, September 24, 1917, War Department, as relates to Major John J. Mudgett, Aviation Section, Signal Corps, is revoked.

First Lieut. Henry Lancaster, S. O. R. C., to active duty, reporting in person to the commanding officer, Fort Myer, Va., for assignment to duty.

Special Order No. 238

First Lieut. Robert S. Potter, Av. Sec., S. O. R. C., to active duty, reporting on October 22, 1917, to the Chief Signal Officer of the army for duty.

Orders heretofore issued directing Capt. Charles C. Ames, Av. Sec., S. O. R. C., to report to the commanding general, Southern Department, Fort Sam Houston, Texas, for duty are revoked.

Capt. Charles C. Ames, Av. Sec., S. O. R. C., proceeding to Fairfield, Ohio, reporting in person to the commanding officer, Wilbur Wright Field, for duty.

First Lieut. Ferel O. Replogle, Av. Sec., S. O. R. C., relieved from duty, proceeding to Dayton, Ohio, reporting to the Lieut. Col., Virginius E. Clarke, Signal Corps, for duty.

Under the provisions of an Act of Congress approved July 24, 1917, Major Harold Geiger, Av. Sec., Signal Corps, is rated as a junior military aeronaut, to date from July 24, 1917.

Capt. Gilbert V. Hamilton, Av. Sec., S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for duty.

Capt. Alfred M. Tozzer, Av. Sec., S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for temporary duty; upon the completion thereof will proceed to Denver, Colorado, reporting by telegraph to the commanding general, Central Department, Chicago, Ill, for duty.

Capt. Robert R. Shaw and First Lieut. William Frew, Av. Sec., S. O. R. C., to active duty, proceeding to Mount Clemens, Mich., reporting in person to the commanding officer, Selfridge Field, for duty.

First Lieut. David A. McCabe, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, School of Military Aeronautics, Princeton, N. J., Princeton University, for duty.

Leave of absence for seven days is granted Capt. Fred Seydel, Signal Corps.

First Lieut. John C. Burkhart, Av. Sec., S. O. R. C., to active duty, reporting in person to the Chief Signal Officer of the army for duty.

First Lieut. Fred E. Hayes, Av. Sec., S. O. R. C., to active duty, proceeding to this city, reporting to the Chief Signal Officer of the army in person for duty.

Capt. Theodore Bailey, Av. Sec., S. O. R. C., relieved from duty, proceeding to Austin, Tex., reporting to the commanding officer, School of Military Aeronautics, University of Texas, for duty.

First Lieut. Herbert W. Seaman, Signal Corps, reporting to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

Capt. Thomas J. Zimmerman, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, Park Field, Millington, Tenn., for duty.

First Lieut. Algernon R. Clapp, Av. Sec., S. O. R. C., to active duty, reportinh to the commanding officer, Selfridge Field, Mount Clemens, Mich., for duty.

First Lieut. Kenneth R. Hyman, Av. Sec., S. O. R. C., to active duty, proceeding to San Antonio, Tex., reporting in person to the commanding officer, aviation station, for duty.

First Lieut. Edgar T. Ferguson, Av. Sec., S. O. R. C., to active duty, reporting in person to the commmanding officer, Army Balloon School, Fort Omaha, Nebraska, for duty.

Capt. Francis D. Bowne, Av. Sec., S. O. R. C., to active duty, reporting to the Chief Signal Officer for the army for temporary duty; upon completion thereof will proceed to Dallas, Tex., reporting to the commanding officer, Love Field, for duty.

So much of paragraph 13, Special Orders No. 223, War Department, Sept. 25, 1917, as directs Major Henry T. Bull, Signal Corps, to proceed to Washington, D. C., reporting in person to the Chief Signal Officer of the army for temporary duty in his office, is amended so as to read Major Bull to report in person to the Chief Signal Officer of the army for duty.

Capt. Arthur D. Butterfield, Av. Sec., S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Chief Signal Officer of the army for duty.

First Lieut. Augustus Heaton, Signal Officers' Reserve Corps, to active duty, reporting in person to the commanding officer, Love Field, Dallas, Tex., for duty.

Capt. John H. Alden, Av. Sec., S. O. R. C., relieved from duty, proceeding to Cambridge, Mass., reporting to the commanding officer, School of Military Aeronautics, Massachusetts Institute of Technology, for duty.

First Lieut. Arthur Orr, Signal Corps, reporting to the Chief Signal Officer of the army for duty.

First Lieut. Edwin S. Pillsbury, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, School of Military Aeronautics, University of California, Bekeley, Cal., for duty.

First Lieut. Walter J. Seaborn, Av. Sec., S. O. R. C., to active duty, reporting to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.



Interior view of the Whitehead Aircraft Company's plant at Surrey, England.

Extracts From Special Order 242

The following named Lieuts., Av. Sec., S.O.R.C., active duty at Hazelhurst Field, Mineola, Long Island, New York: Harold B. Forman, James E. Meridith, George M. Crawford.

First Lieut. Harold B. Reed, Av. Sec., S.O.R.C., to duty at School of Military Aeronautics, University of California, Berkeley, California.

First Lieuts. Arthur L. Richmond and Frederick H. Harvey, Av. Sec., S.O.R.C., from present duties to Scott Field, Belleville, Ill.

The resignation of First Lieut. William S. Smith, S.O.R.C., has been accepted by the President.

Major Edward E. McCamon, Signal Corps, to Chief Signal Officer of the Army for assignment to duty.

Action of Chief Signal Officer relieving First Lieut. William L. Campbell, Av. Sec., S.O.R.C., from duty, Washington, D. C., and directing him to proceed to New York City, New York, on September 20th, 1917, confirmed.

Capt. Paul D. Mills, Av. Sec., S.O.R.C., to Hazelhurst Field, Mineola, Long Island, New York.

Capt. Gilbert V. Hamilton, Av. Sec., S.O.R.C., to Pittsburgh, Pa., reporting by letter to the Chief Signal Officer of the Army for duty.

Capt. Charles E. Coates, Signal Corps, from duty Signal general supply depot, El Paso, Texas, to Atlanta, Georgia., reporting upon arrival to Chief Signal Officer of the Army for duty as supply officer, Signal Corps General Supply Depot, at that place.

Paragraph 21, S. O. 54, relating to First Lieut. Paul L. Ferron, Coast Artillery Corps, is amended to detail Lieut. Ferron in the Aviation Section of the Signal Corps and rate him a junior military aviator from October 26, 1916.

Capt. Seth W. Cook, Cavalry, orders are amended to detail Aviation Section, Signal Corps, and rate him junior military aviator from May 3rd, 1917.

Capt. Isaac H. Saunders, Av. Sec., S.O.R.C., active duty, reporting to the Chief Signal Officer of the Army for temporary duty, upon completion of this duty to proceed to Atlanta, Georgia, reporting by telegraph to the Commanding General Southeastern Department.

First Lieut. Robert G. Thach, Av. Sec., S.O.R.C., to Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Harry P. Warren, Av. Sec., S.O.R.C., to Army Balloon School, Fort Omaha, Nebraska.

First Lieut. David J. Jones, Av. Sec., S.O.R.C., to Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. Thomas D. Jordan, Av. Sec., S.O.R.C., to Army Balloon School, Fort Omaha, Nebraska.

First Lieut. Charles L. Haywood, Av. Sec., S.O.R.C., to Army Balloon School, Fort, Omaha, Nebraska.

First. Lieuts. Thomas Carroll and Ector O. Munn, Av. Sec., S.O.R.C., to Signal Corps concentration depot, Mineola, Long Island, New York.

First Lieut. John A. Hambleton, Av. Sec., S.O.R.C., Hazelhurst Field, Mineola, Long Island, New York.

First Lieut. John I. Moore, Av. Sec., S.O.R.C., to School for Aerial Observors, Fort Sill, Oklahoma.

First Lieut. Samuel T. Moore, Av. Sec., S.O.R.C., to Army Balloon School, Fort Omaha, Nebraska.

Capt. Isaac H. Saunders, Av. Sec., S.O.R.C., detail member examining board to meet at Atlanta, Georgia, to examine applicants for commission in the Aviation Section, S.O.R.C.

Assignment to active duty of Capt. Harold C. Eustis, Av. Sec., S.O.R.C., on September 19, 1917, by Chief Signal Officer of the Army is confirmed.

Resignation of First Lieut. John O. Schweer, Signal Officers' Reserve Corps, has been accepted by the President.

First Lieut. Forrest H. Sholts, Av. Sec., S.O.R.C., detailed member board of officers to examine applicants for commission, aviation section, S.O.R.C., at Chicago, Illinois.

First Lieut. Lionel M. Woolson, Signal Corps, to McCook Field, Dayton, Ohio.

Major Bud D. Gray, Av. Sec., S.O.R.C., active duty, reporting to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Roderick H. Jones, Av. Sec., S.O.R.C., detailed member of board of officers, to meet at New York City, N. Y., to examine applicants for commission, Aviation Section, Signal Officers' Reserve Corps.

The following named officers will report in person to the Chief Surgeon, Aviation Section, Signal Corps, this city, for assignment to duty as members of a medical research board: Major John B. Watson, Signal Officers' Reserve Corps; Major Eugene R. Lewis, Medical Reserve Corps; Major William H. Wilmer, Medical Reserve Corps, Major Edward E. Seibert, Medical Reserve Corps.



Lieut.-Col. Frederick M. Jones, who is in charge of the Chanute Field at Rantoul, Illinois.

First Lieut. John L. Carney, S.O.R.C., from station at Fort Wood, New York, to New York City, New York.

First Lieut. Morgan W. Wickersham, Av. Sec., S.O.R.C., announced as on requiring him to participate regularly and frequently in aerial flights from October 2, 1917.

Resignation of First Lieut. Clarke Thomson, S.O.R.C., has been accepted.

First Lieut. Harry R. Temple, Signal Corps, to Hazelhurst Field, Mineola, Long Island, New York.

A board of officers to consist of First Lieut. R. E. Vaughn, First Lieut. S. A. Blair, First Lieut. T. J. D. Fuller, Av. Sec., S.O.R.C.; and First Lieut. Robert McCreery, Medical Reserve Corps, appointed as examining board for appointment of aviation section, S.O.R.C., at Fort Sill, Oklahoma.

Daniels Commends Airmen for Bravery

Josephus Daniels, Secretary of the Navy, commended George R. Buckley, seaman, and James R. Hay, coxswain, both attached to the aeronautic station at Pensacola, Fla., for bravery and gallantry.

A motor dory operated by George R. Buckley and A. J. Gash, apprentice seaman, took fire and the two men jumped overboard. Gash was unconscious, and Buckley, at great risk to himself, swam to his rescue and succeeded in keeping him afloat until a life preesrver thrown to him struck him in the face and caused him to relinquish his hold. Coxswain Hay, who had reached the vicinity in the commandant's barge, jumped overboard and dived to the bottom of the bay in an attempt to recover Gash's body.

Extracts From Special Orders 241

First Lieut. Philip P. Cook, Signal Corps, to commanding officer, Kelly Field, South San Antonio, Texas.

Capt. Howard C. Marmon, Av. Sec., S. O. R. C, and First Lieuts. Edgar L. Vail, and Howare E. Blood, Signal Corps, ordered to McCook Field, Dayton, Ohio, for duty.

Major Jesse G. Vincent, Signal Corps, to McCook Field, Dayton, Ohio, reporting to the commanding officer, for duty.

First Lieut. James Suydam, S. O. R. C., to active duty, proceeding to Washington, D. C., reporting in person to the Acting Chief Signal Officer of the Army, for assignment to duty.

First Lieut. Carl D. Matz, Signal Corps, to School of Military Aeronautics, University of Texas, Austin, Texas, for duty.

First Lieut. Joe G. Estill, Jr., Av. Sec., S. O. R. C., to active duty at Hazelhurst Field, Mineola, Long Island, New York.

Extracts From Special Orders 244

Major George E. Lovell, Jr., junior military aviator, Signal Corps, is relieved from duty with the 1st Aero Squadron.

The assignment by the chief surgeon, Aviation Section, Signal Corps, of Capt. Francis Lane, Medical Reserve Corps, to active duty with the physical examining unit, Av. Sec., Signal Corps, Chicago, Illinois, from Sept. 6, 1917 is confirmed and approved.

First Lieut. Lawrence S. Davos, Signal Corps will proceed to Washington, D. C., reporting in person to the Chief Signal Officer of the Army, for duty.

Major Thorne Deuel, Signal Corps, will proceed to Park Field, Millington, Tenn., and report to the commanding officer for duty.

First Lieuts. Carl B. Pfeifer, Harold L. Lines and Carl A. Miller, Signal Corps, will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Charles E. McCullough, Av. Sec., S. O. R. C., is assigned to active duty, reporting in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. John T. McAniff, S. O. R. C., is relieved from duty, proceeding to Camp Joseph E. Johnston, Jacksonville, Florida, reporting to the commanding officer, quartermaster training and mobilization camp, for duty as camp signal officer.

First Lieut. Frank P. McCreery, Av. Sec., S. O. R. C., is announced as on duty requiring him to participate in aerial flights regularly and frequently from October 3, 1917.

Second Lieut. Edgar M. Ackerman, Infantry Officers' Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., reporting in person to the Chief Signal Officer of the Army, for duty.

Capt. William P. Field, Av. Sec., S. O. R. C., will proceed to Ithaca, New York, take station at that place, and report by letter to the commanding general Eastern Division, for duty.

Capt. William P. Field, Av. Sec., S. O. R. C., is detailed a member of the board of officers appointed by paragraph 27, Special Orders No. 132, War Department, June 8, 1917, to meet at Ithaca, New York, for the purpose of examining applicants for commission in the Aviation Section, S. O. R. C.

The following named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Riley, Kans., and are assigned to the Aviation Section, Signal Corps, United States Army, proceeding to South San Antonio, Texas, reporting to the commanding officer in person, Kelly Field, for duty, and by letter to the commanding general, Av. Sec., Signal Corps, Washington, D. C.: First Lieuts. George S. Darby, Sigfred Engh, Sigurd H. Kraft, Robert C. Murphy, Azro J. Pardee.

First Lieut. James Suydam, S. O. R. C., relieved from duty in the office of the Chief Signal Officer proceeding to Little Silver, N. J., reporting in person to the commanding officer, Camp Alfred Vail, for duty.

First Lieut. George P. Marx, S. O. R. C., relieved from duty at Camp Alfred Vail, Little Silver, N. J., proceeding to this city and reporting in person to the Chief Signal Officer of the Army, for duty.

The following named officers of the Medical Reserve Corps, are relived from duty at the medical officers' training camp, Fort Riley, Kans., assigned to the aviation section, Signal Corps, United States Army, proceeding to Mineola, Long Island, New York, reporting in person to the commanding officer, Hazelhurst Field, for duty, and by letter to the commanding general Aviation Section, Signal Corps, Washington, D. C.: First Lieuts. Charles S. Ballard, Frederick E. Clark, Rollen W. Harrod, Maurice C. Henessey, Robert S. Ideson.

Paragraph 158, Special Orders No. 230, War Department, Washington, D. C., October 3, 1917, relating to First Lieut. Frank M. Murphy, Aviation Section, S. O. R. C., is amended to read First Lieut. Frederick M. Murphy.

So much of paragraph 75, Special Orders No. 163, War Department, July 16, 1917, as relates to First Lieut. William J. M. Hutchins, S. O. R. C., is revoked.

So much of paragraph 67, Special Orders No. 233, War Department, October 6, 1917, as relates to Capt. William L. Patterson, Signal Corps, is amended to read Major William L. Patterson, Signal Corps.

Paragraph 126, Special Orders No. 221, War Department, Sept. 22, 1917, relating to First Lieut. Howard H. Powell, Aviation Section, S. O. R. C., is amended to read First Lieut. Howard H. Powel.

Extracts From Special Orders No. 245

Major Leo A. Walton, Signal Corps, will proceed to Wichita Falls, Texas, reporting to the commanding officer in person, Call Field, on or about November 10, 1917, for duty.

First Lieut. Malcolm M. Hayward, Signal Corps, will proceed to this city and report in person to the Chief Signal Officer o the army for duty.

First Lieut. Philip Lehman, Medical Reserve Corps, is relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Indiana, proceeding to Fort Omaha, Nebraska, reporting in person to the commanding officer, United States Army Balloon School, that post, for duty with the Aviation Section, Signal Corps, and by letter to the commanding general, Aviation Section, Signal Corps, Washington, D. C.

Capt. Charles W. Kollock, Medical Res. Corps, is assigned to active duty in the Aviation Section, Signal Corps, and will proceed to Philadelphia, Pa., reporting in person to the officer in charge, physical examining unit, Aviation Section, Signal Corps, for temporary duty, upon completion of which will return to Charleston, S. C., for duty in charge of the physical examining unit, Aviation Section, Signal Corps, that place, and report by letter to the commanding general, Aviation Section, Signal Corps, Washington, D. C.

Majs. Shepler W. Fitzgerald and Walter G. Kilner, junior military aviators, Signal Corps, are relieved from duty as members of the board of officers appointed by paragraph 58, Special Orders, No. 152, War Department, July 2, 1917, for the purpose of examining officers for rating as junior military aviators.

First Lieut. William A. Fox, Aviation Section, S. O. R. C., will proceed to the Signal Corps aviation station, Hazelhurst Field, Mineola, Long Island, N. Y., and report in person to the commanding officer, 201st Aero Squadron, for duty.

First Lieut. Roger B. Whitman, Aviation Section, S. O. R. C., is assigned to active duty and will report in person to the commanding officer, Langley Field, for duty.

Major George W. Krapf, junior military aviator, Signal Corps, is detailed as a member of the board of officers appointed in paragraph 58, Special Orders, No. 152, War Department, July 2, 1917, to meet at the Signal Corps Aviation School, Mineola, Long Island, N. Y., for the purpose of examining officers for rating as junior military aviators.

The following named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Indiana, and will proceed to San Antonio, Texas, reporting in person to the commanding officer, Signal Corps Aviation School, Kelly Field, for duty and by letter to the commanding general, Aviation Section, Signal Corps, United States Army, Washington, D. C.: First Lieuts. Joseph Brumberg, Paul C. Carson, Carroll D. Conrad, Richard P. Doody, James J. Fitzgerald, Milton H. Goldberg, Samuel B. Kaufman, Philip J. Lipsell, Robert D. Scott, John C. Lee.

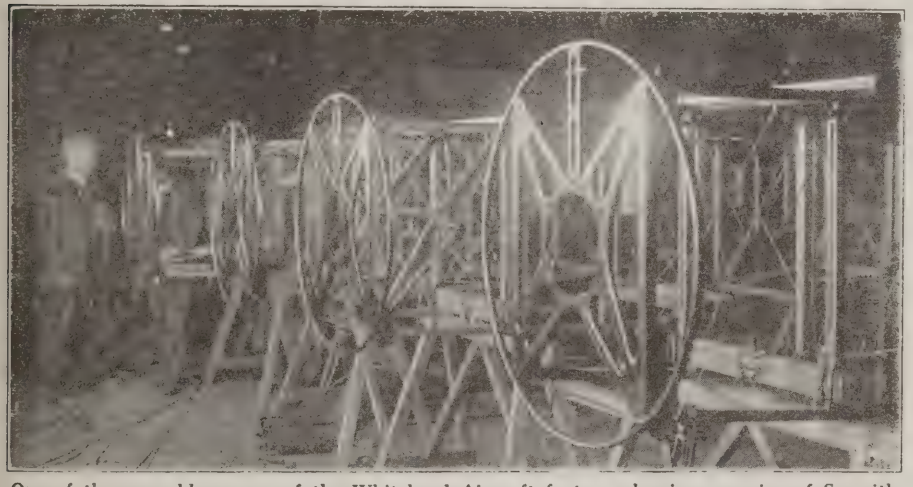
Capt. George B. Smith, S. O. R. C., is relieved from duty and will proceed to Camp Devens, Ayer, Mass., reporting in person to the commanding general, 76th Division, for duty with the 401st Telegraph Battalion.

The following named officers of the Medical Reserve Corps are relieved from their present duties at Hazelhurst Field, Mineola, Long Island, New York, and report in person to the commanding officer of the aero squadron indicated below, that place, for duty: Thomas E. Blackburn, 200th Aero Squadron, James L. Pennington, 201st Aero Squadron.



Major Frederick Libby, Ace American Aviator, who joined the Service early in the war and who is credited with having destroyed 14 enemy machines.

Capt. William C. Ocker, Aviation Section, S. O. R. C., will proceed from Essington, Pa., to Mineola, Long Island, New York, reporting to the president of the board of officers appointed in paragraph 58, Special Orders, No. 152, July 2, 1917, War Department, for examination to determine his qualifications for rating as junior military aviator, and upon the completion thereof will return to his proper station.



One of the assembly rooms of the Whitehead Aircraft factory showing a series of Sopwith fuselages.

Extracts From Special Orders No. 245 and 246

Major Edward L. Hoffman, Signal Corps, to Park Field, Millington, Tenn.

Capt. William P. Field, Av. Sec. S. O. R. C., detailed member board of officers to meet Ithaca, New York, to examine applicants for the Aviation Section, S. O. R. C.

Lieut. Col. Irving J. Carr, Signal Corps, to duty at Washington, D. C.

Capt. James Murray, Av. Sec. S. O. R. C., to active duty at Hazelhurst Field, Mineola, Long Island, New York.

Capt. Edward D. Payne, Av. Sec., S. O. R. C., report to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Charles S. Roberts, Av. Sec. S. O. R. C., active duty at Chanute Field, Rantoul, Illinois.

Capt. Kosciusko W. Constantine, Medical Reserve Corps, to active duty at Birmingham, Alabama, in charge of the physical examining unit Aviation Section, Signal Corps.

Capt. Thomas J. Kehoe, Av. Sec. S. O. R. C., to active duty, reporting to the Chief Signal Officer of the Army for assignment to duty.

Capt. Charles G. B. Klophel, and First Lieut. Walter F. McKenzie, Medical Reserve Corps, from Fort Benjamin Harridon, Indiana, to Camp Alfred Vail, Little Silver, N. J., for duty with the Signal Corps.

First Lieuts. William Fox and Nicholas McDonald, S. O. R. C., report for duty, Photographic Division of the Signal Corps, Washington, D. C.

First Lieut. W. Van Nostrend, S. O. R. C., to Camp Alfred Vail, Little Silver, N. J.

To duty at Signal Corps Concentration depot, Garden City, Long Island, New York, for instruction: Capt. Frank Burton, Capt. Russell W. Bryant, Capt. Melville Gillett, Capt. Frederick A. Preston, Capt. Henry A. Odell, Capt. Alexander R. Robertson, Capt. John M. Satterfield, First Lieut. Charles P. Devine, First Lieut. George Bleistein, Jr., First Lieut. Earl L. Miller.

First Lieut. Warren E. Eaton, and Alfred W. Lawson, Av. Sec. S. O. R. C., to Signal Corps Concentration Depot, Mineola, Long Island, New York, for assignment to duty.

American Flyers Help Win Victory

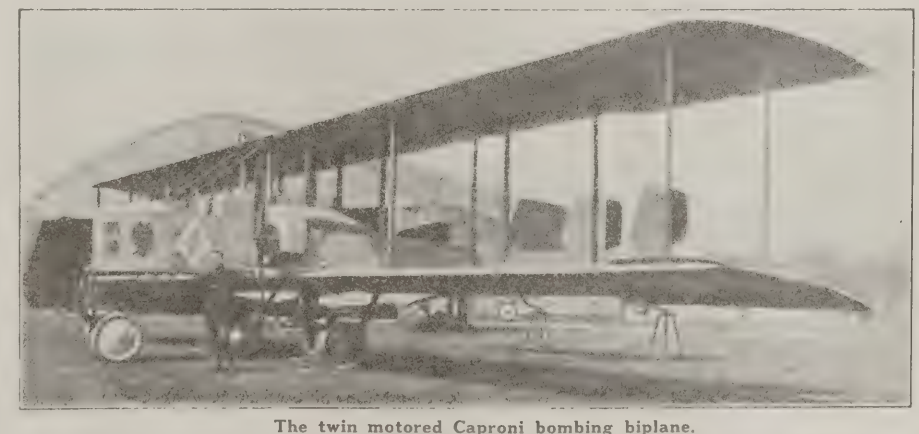
Paris.—America was well represented in France's latest offensive on the Chemin des Dames, for the Lafayette Escadrille was in the thick of the fighting. So far the American pilots, indeed the whole French aviation force in that sector, have reported that they have had all their own way.

During the artillery bombardment few German machines were seen, while the Allied pilots continually flew over the German lines well into the German occupied territory. News now comes, however, that the famous German Tango and Circus Escadrilles have been moved from Verdun and are now facing the French in the Aisne district.

During the last days of the bombardment five members of the Lafayette Escadrille, Adjutant Walter Lovell of Concord, Mass., Sergeant Henry Jones of Herford, Pa., Sergeant Kenneth Marr of San Francisco, Sergeant James U. Hall of Colfax, Ia., and Sergeant David Peterson of Honesdale, Pa., went out to protect the big French photographing machines which penetrated more than eight miles into enemy positions, recrossing the lines at a height of 8,000 feet.

Two German biplanes came out to attack the formation, but Jones and Marr dived at them, driving them away by an extremely hot fire from machine guns. The photographing machines remained over the German lines an hour, accompanied on their return by Marr, Jones and Hall.

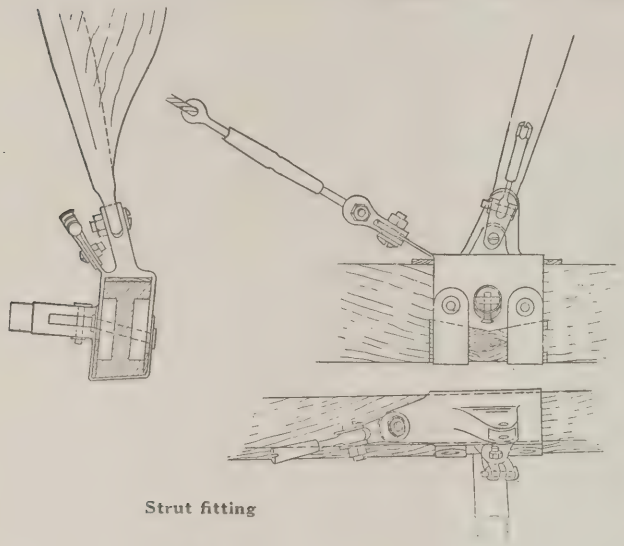
Lovell and Peterson pushed forward looking for German machines. While flying at 6,000 feet they came across three big biplanes well camouflaged over a forest. They dived, the hail of fire from the American pilots breaking up the enemy formation. The color of the German planes blended so well with the trees that they made difficult targets.



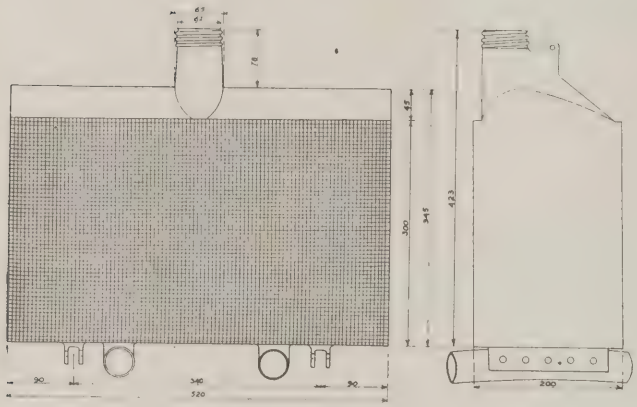
The twin motored Caproni bombing biplane.

DETAILS OF THE HANSA-BRANDENBURG TRACTOR

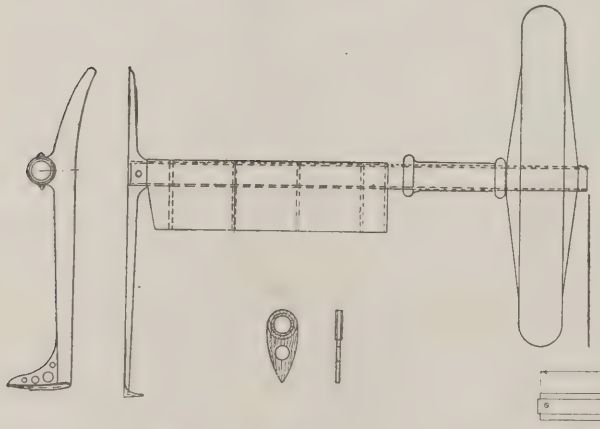
(Continued from last week)



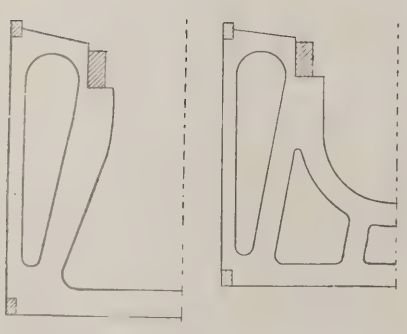
Strut fitting



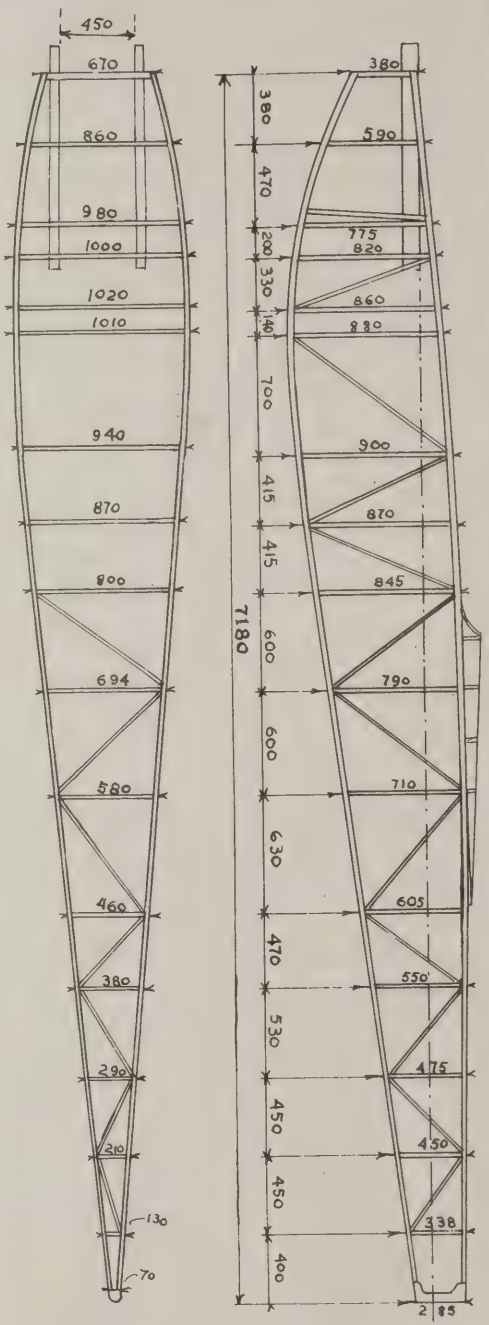
The radiator



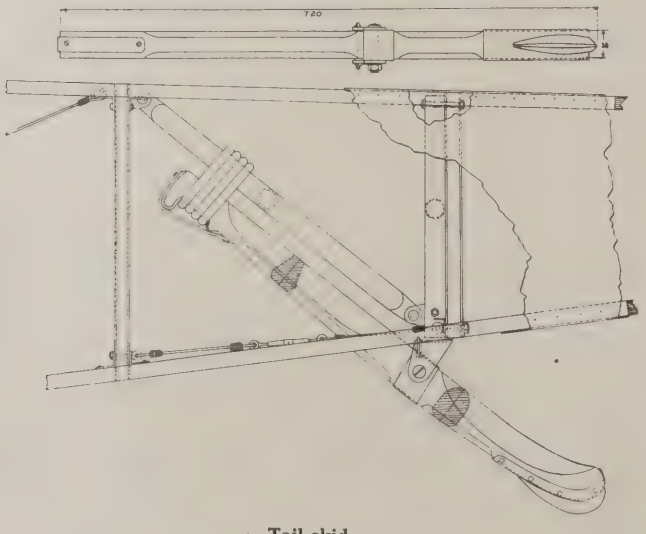
Claw brake and axle



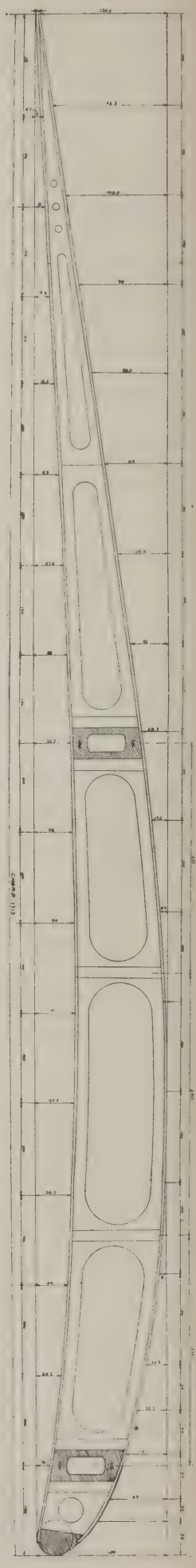
Two of the diaphragms or engine-bed carriers



Above—Fuselage layout Right—Wing curve



Tail skid



TECHNICAL CONSIDERATIONS OF MATERIALS EMPLOYED IN AEROPLANE CONSTRUCTION

By OTTORINO POMILIO

Director of Pomilio Aircraft Company of Turin, Italy

IT has often been said that the wood construction and the wood and steel construction, now in vogue, will soon be replaced by an all-metal construction.

We have a few examples where steel has been used for the fuselage and even for the framework of the wings. But wood, however, is still being used on a vast scale.

Wood has its defects; first among these is the property of absorbing moisture. From that point of view there may be a great future to all metallic construction in the field of hydro-navigation. Nevertheless, wood has other properties which makes it a most excellent material for aeronautical constructions. We will especially discuss its light weight and elasticity. In a fall, the wooden parts of the machine act as excellent buffers.

The general tendency, as applied to the machines now largely in use, is to perfect more and more that system of mixed construction (wood, tubing, and steel wires) which, when applied with proper criterion, will give a most remarkable combination of homogeneous construction, elasticity, strength and light weight.

We think it might be interesting to interpolate here a brief discussion on the qualities of the woods, metals and cloths most generally used in aeroplane construction.

Woods

There are several kinds of wood used, and these vary according to the function of the various parts and to the stresses to which they are subjected. The members subject to flexure, impact, etc., are generally made from hardwood, having elastic properties; those members subject to compression are made of resinous wood, which is not as strong but is lighter; this is done in order to have the moment of inertia of the section of the member large enough to eliminate bending due to compression.

In every case the wood must not be rotten or in a decaying state. It must be hard, homogeneous in structure, straight grained, without knots or other defects; it must also be well-seasoned and dry. Wood dried in steam-kilns should not be accepted.

In order to ascertain the adaptability of a given wood to aviation purposes, Hiram Maxim has proposed that its specific resistance be determined, *i. e.*, the ratio between the ultimate resistance expressed in No. of Sq. in. and the specific weight expressed in No. of Cu. ft

In the following table are listed several kinds of wood with their respective, ultimate resistance, weight per cubic foot, and specific resistance as defined above.

Kind of Wood	Ultimate Resistance No. of Sq. in.	No. of Ft.³	Specific Resistance
English Ash....	16,500	54.7	302
White Ash.....	14,500	45.2	320
Bamboo	6,530	25.1	260
American Cedar	11,950	43.0	278
Spruce (European)	8,530	33.5	255
American White Pine	12,160	35.1	346
Hickory	11,360	51.8	219
Honduras Mahogany	21,750	36.6	594
English Oak....	7,810	56.2	139
White Oak.....	17,050	56.3	303
Poplar Oak.....	7,240	25.2	287
Willow	13,420	38.3	350

It is known that woods may be classified as follows: hard woods, resinous woods, soft woods.

Among the hardwoods, ash, hickory and walnut are the ones most generally used. Of these, ash is the wood most widely employed. It has strength, hardness, elasticity and is easily bent if heated, especially if heated with steam. The preceding qualities are characteristic of Italian ash. The so-called Albanian ash cannot be considered because of its low resistance.

American hickory resembles ash in many of its properties; being straight grained and having very few knots, the loss of material when working out defects is minimized so that although slightly more expensive than ash it may in some cases be used to advantage. Hickory must not be completely seasoned because when dry it becomes brittle. Otherwise it has good elastic properties and is easily bent. So much so that a lath of this wood can be easily made into a knot, like rope.

Walnut (white) is used essentially in the manufacture of propellers: It must be hard, uniform in structure, and very close-grained.

Among the resinous wood we have ordinary spruce, Norwegian spruce, and the pitch pines (the kinds of pitch-pines most commonly used are Oregon Pine and American Western Spruce). Ordinary spruce, is not uniform in structure and has a low ultimate resistance, and is therefore never employed in aeroplane construction. Norwegian spruce, or red spruce, is often used because of its better qualities of resistance, etc.

The wood obtained from the American Western pines is harder, tougher, much denser and has better lasting qualities than the common or Norwegian spruce. These characteristics are due to the large quantity of resin-bearing ducts. The good qualities attributed to these woods are straight grain, uniform structure, few knots, plenty of gluing material or resin (but in not too excessive a quantity) and, etc.

Oregon Pine and Western Spruce, which are two varieties of pitch pine, are much denser than ordinary pines and have high compression, tension and shearing strength.

The soft woods are used in aeroplane construction to make the cross for wing ribs, or accessory parts, such as tank supports, foot-rests, etc., which must be of light weight and which need not be of great strength.

Of the soft woods, we may note poplar, birch, linden-tree, etc. Below are given the density and ultimate strength of some of the woods discussed above:

WOOD	No. ft. 3	Ultimate Resistance No. sq. in.
Ash	40.6-53.1	11000-14650
Walnut	42.5-56.2	11000
Norwegian Spruce.	31.2-37.5	8780-10250
Oregon Pine.....	37.5-43.7	.....
Poplar	31.2-37.5	7320
Linden Tree.....	37.5	.....

Before ending our discussion on woods, we will say a few words on wooden members of hollow section, which are still largely used in aviation. In Fig. 1 may be seen several of the most common types.

Various criterions have led constructors to adopt hollow sections: First and foremost the necessity of increasing the moment of inertia of the section, without increasing the weight of material, or even obtaining a decrease in the weight. Also the wooden parts of a member will warp easily, especially in damp hangars.

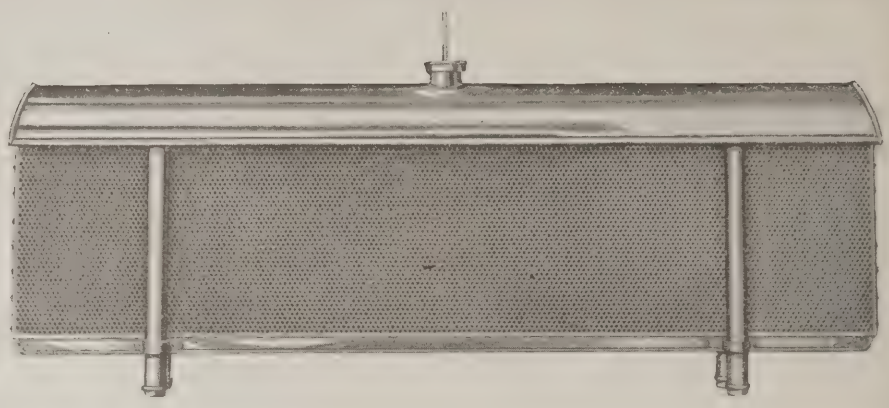
As hollow members are generally made in two halves glued together, these two parts are joined so that the tendency one

(*Continued on page* 333)



Interior view of the assembling room of the Pomilio aeroplane factory, at Turin.

MOTOR RADIATORS FOR AEROPLANES

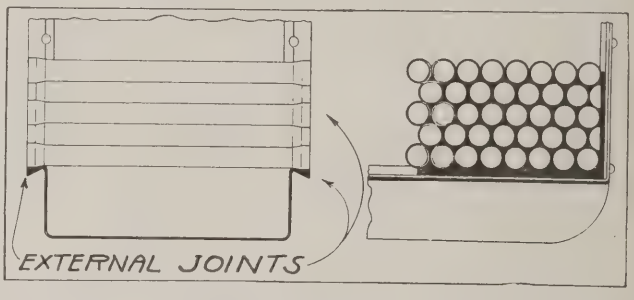


AN aircraft in general involves engineering problems which are most difficult to solve. One can say that the most perfect aircraft is the one which shows the best balance between weight and capacity on the power generating and absorbing part, and between air resistance and strength on the structural part of the machine.

The power plant includes the radiator, which, while taking a seemingly secondary and more passive part, is of vital importance. It is as inseparable from the motor as the lungs are from the heart, the performance of either of which is only possible as long as an undisturbed circulation and regeneration of the fluid is maintained. With regard to the performance, these two factors are essential for a radiator and they can be obtained through common engineering practice; however, other equally essential factors enter into the design of the aircraft radiator, which on account of their contradictory features are extremely difficult to meet.

For example—to secure the necessary capacity, a large cooling surface must be exposed to the air, but with regard to the air resistance a small surface is desired. In war aircraft to prevent it being too large a target for an enemy it should be inconspicuous, but this is again contradictory to its nature. The wall of the cooling surface must be thin so as to transmit the heat and yet it must be tight and durable. The possibility of leaks requires accessibility to all parts of the cooling surface, but the most suitable cooling surface is of a type which by its very nature is rendered difficultly accessible. Slight vibration on an aeroplane requires material strength but this is again opposed by the desire to lessen the weight. The above mentioned points may suffice to show that the radiator is an engineering problem the solution of which requires thorough study of its caloric aero dynamic and material features.

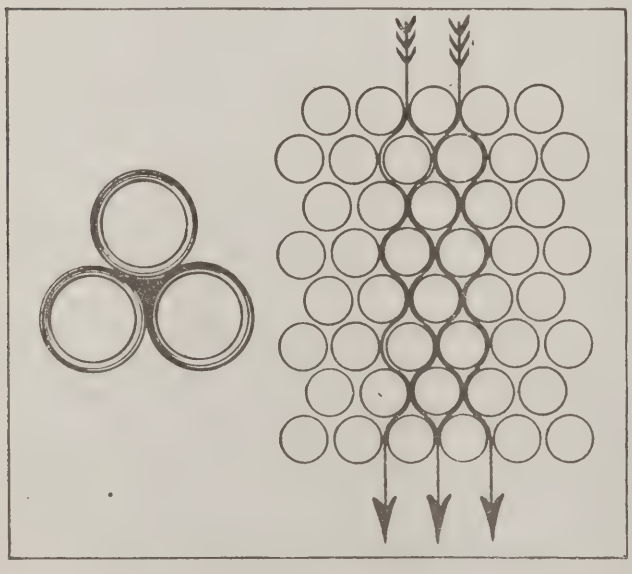
One radiator which has undergone the wonderful metamorphosis of the flying machine and in continuous adherence to its progress has grown with it, is well-known in Great Britain as the product of the Motor-Radiator Manufacturing Company, of Birmingham, England. The Motor Radiator Company, of Philadelphia, Pa., has secured the patents and as it may interest those in engineering circles, a short description is given of it here.



Figs. 3 and 4. Arrangement of tubes and typical construction of casing, confining possibilities of leaks to the outside, where visible and accessible.

This radiator is of the cellular type and consists of seamless drawn brass tubes the ends of which are brazed together in one operation, thus forming a solid block which can be machined on both sides. Figs. 1 and 1-A, show the arrangement of the tubes with the characteristic triangular solid metal between each three tubes. This triangle is bordered by three arches which support the tubes and reinforce their walls so that the front and rear can be filed off or even be turned on a lathe. It will later be explained why machining of the two surfaces is desired.

Fig. 2 demonstrates the flow of the water. The water has to pass along the entire cooling surface which on the other side is in direct contact with the air. The tube block is soldered into the casing which preferable is made as shown in Figs. 3, 4 and 5. The front and rear opening of the casing into which the tube block is fitted is provided with a projecting rim thus giving the tube block a large bearing surface and as



Figs. 1 and 2. Cross section through tubes, showing flow of water.

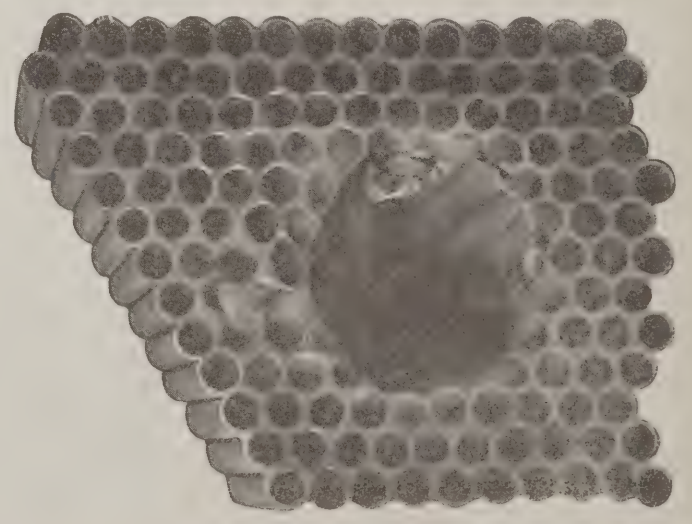
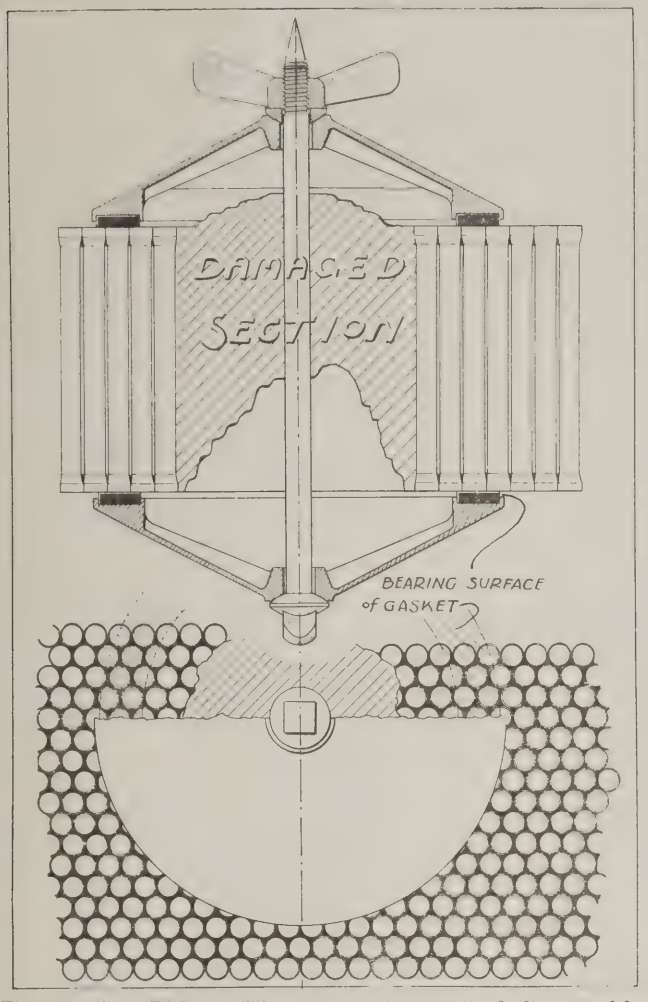


Fig. 5. A radiator damaged by shell fire.



Figs. 7 and 8. Disks used for temporarily stopping leaks caused by shell fire.

only external joints are obtained by this method, soldering and repairing are greatly facilitated.

All joints of the radiator being exclusively external is a great advantage since repairs can easily be made and even large sections replaced without touching the casing and without leaving any traces. In case of inuries by shell fire or other damage, (such as shown in Fig. 5), the "first aid" will temporarily but safely take care of the "wounds" until the "hospital"

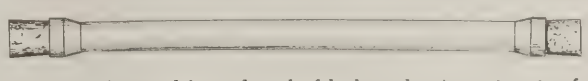


Fig. 6. Corks inserted in each end of leaky tube prevent water from escaping.

is reached. The "first aid" as shown in Figs. 7 and 8 consists of two bell-shaped discs and a pointed steel bolt which is driven through the damaged section. The wing nut presses the two discs tight on the block and thus isolates the section preventing the loss of water. To allow the rubber gasket to make a tight fit explains the necessity of machining the front and back surfaces.

Smaller defects can be temporarily mended with putty or single leaky tubes can be isolated by means of corks as shown in Fig. 6. The leaky tubes are removed by means of two pieces of round copper bar about eight inches long and slightly tapered so as to fit the expanded ends of the tubes. These instruments are heated to a dark red color and inserted into the ends of the defective tubes. By simultaneous rotating motion and at the same time pushing in a longitudinal direction the tube will loosen and come out easily. A new tube is inserted and soldered around the ends. No matter what nature the injury to the cooling surface may be there is always a possibility of immediate relief. This point cannot be appreciated sufficiently especially in connection with military planes where time and material are scarce. The illustration at the top of the opposite page shows a Sturtevant radiator, where the geometrically accurate arrangement of the great number of tubes is of special interest.

(*Continued from page* 331)

part has of warping will be neutralized to a large degree by the warping action of the other part. In this manner the possibilities of the member being deformed are minimized or even eliminated.

Hollow members are built up as follows: Each member is made up of two symmetrical parts, properly shaped, and held together by glue and two tennons running the whole length of the member.

In order to stiffen the member, and to eliminate the possibility of the parts ungluing, it is wound tightly with glued cloth. This operation may be performed by either of two methods. The choice of method depends on whether the member is of consistant cross section as in the wing beams or of variable cross section as in the interplane struts. In the former case the cloth may be wound spirally, the spirals over-lapping each other.

In the latter case, the cloth is put on in the form of rings, placed at convenient intervals.

In passing we might mention that the German Military Authorities specify that all wooden parts (hollow or solid) in the vicinity of the cock-pits, be wound with cloth, in order to avoid splinters forming, in case of accident.

The glue used must be applied warm and very fluid, and if possible, the surroundings should be heated and protected from air currents.

It is also advisable to heat the surfaces to be glued together. The glued parts are then pressed fast with proper screws, etc.

For small aeroplane members (wing ribs, etc.), types of glue which are supplied cold may be used.

Zeppelins and Super-Zeppelins

In a book published eight years ago, "Aerial Warfare," Mr. Hearne was one of the first to warn England against the menace of the Zeppelins, and his prophesies have since had a remarkable fulfilment. The present volume is intended to arouse the English public to a realization of its danger present and future, and create an intelligent demand for greater aerial forces. No attempt is made to minimize the effect of the Zeppelin raids on England, either as regards loss of life and property or prestige. Several chapters are devoted to a technical description of the air ship but in a style adapted to the general reader. The effect of atmospheric conditions on flights, airship construction, the history of their development and operation are discussed in detail. An interesting chapter is devoted to the best method of fighting the Zeppelins, the most efficient guns which may be employed and the aerial tactics to be followed. Mr. Hearne believes that the Zeppelins may be defeated by airships of a super-Zeppelin type, and is inclined to disparage the aeroplane as a defensive weapon. The possibilities of raiding Germany with giant air ships are discussed in the light of the latest aerial strategy. Practical suggestions are made for self protection during actual raids. Following the war Mr. Hearne sees a great commercial future for the super airship, with New York brought within thirty hours of London. The book is profusely illustrated with photographs and drawings. The book is for sale at The Aeronautic Library, 280 Madison Avenue, New York City, price $1.00 net.

Descriptive Meteorology

In any science where development is so rapid as in meteorology a new work of an authoritative nature is especially welcome. Dr. Moore's position as Chief of the United States Weather Bureau and as active member of many societies is an assurance of the up-to-date character of his work. He has aimed to provide a book which will serve as a comprehensive introduction to modern meteorology for those entering the service of the U. S. Weather Bureau, and for other students. Many of the best books on this science have become more or less obsolete, or, being in a foreign language, are not available for the average reader. The discussion of the subject is besides adapted to the reader who does not possess a wide knowledge of mathematics, while technical language has been avoided as far as possible. The author has kept constantly in mind that to the reader meteorology may be an unknown science. Special effort has been made to have the theory of meteorology lead up to the art of weather forecasting. Many new features on meteorology are discussed. The book is profusely illustrated with drawings and charts many of them in color. For sale at The Aeronautic Library, 280 Madison Avenue, New York City, price $3.00 net.

Manual for Aero Companies

In convenient pamphlet form suitable for carrying in the pocket, considerable information has been gathered of service to flyers. No claim is made at originality, the material being adapted from various service regulations at home and abroad. The reader will find no definite flying instruction. Many rules are laid down, however, for the care of aeroplanes and hangars, the organization of workshops, and for the assembling of machines. The various instruments used in aerial navigation are briefly described. There are chapters of air tactics, signalling and wind tables. The book is suggestive and will serve as a ground work in training flyers. For sale at The Aeronautic Library, 280 Madison Avenue, New York City, price $1.00.

FOR THE MEN WHO ARE TO GO OVERSEAS—IV

HAVING received a number of requests from aviation instructors and students for French aeronautic literature and realizing that the students who will soon go to France should be familiar with the French aeronautic terms as popularly employed in descriptive literature—instead of merely giving a dictionary of terms; and realizing also the necessity of familiarizing them with the general features of the German machines which they will have to fight, AERIAL AGE sent to France for the very latest technical aeronautic literature and description of German machines.

The fourth instalment, given herewith, is part of a chapter of the work "L'Aviation Et La Guerre," edited for the Aero Club of France by Jean Lagorgette, the noted French aeronautic engineer.

Officer instructors have suggested that the best plan would be to print the French text without attempting to give the English translation of every word, as the first need is to supply the instructors with the necessary material, to enable them to read from the French and explain to the students while they take notes, which is the present practice in teaching all the other subjects.

Notes, Relatives aux Avions Allemands (Fourth Instalment)

Per JEAN LAGORGETTE

5° Halberstadt de chasse D...

Les avions que la Société d'Halberstadt, à Halberstadt, appelle elle-même modestement les « chéris des premiers aviateurs de guerre » sembleraient plus répandus sur le front anglais que sur le front français, si l'on en jugeait d'après le nombre proportionnel avec les autres avions qui ont été abattus jusqu'à présent (D. III 206; D. V. (?) n° 234, abattu le 15 février 1917, etc...) (**Aérophile**, octobre 1916, p. 299 et nov. 1916, p. 340).

Ce sont des **biplans monoplaces de chasse** (1)

Leur longueur totale est de 7 m. 30.

AILES. — L'envergure des ailes supérieures, 8 m. 70 (Albatros D. I. de chasse : 8 m. 60), dépasse un peu celle des ailes inférieures, 7 m. 85.

Elles sont en V (vues d'avant), gauchies et sensiblement décalées, — les inférieures étant de 0 m. 45 en retrait, ce qui dégage la vision en avant.

Elles ne sont pas en flèche, et sont presque rectangulaires. Leurs ailerons, qui existent seulement aux ailes supérieures, débordent légèrement et sont gauchis, relevés vers le haut, à leur extrémité (comme presque tous les ailerons allemands). Ils sont articulés sur un longeron secondaire, en arrière du longeron principal postérieur.

Profondeur : 1 m. 56. — Surface : 24 mq. 50 environ. — Intervalle entre ailes : 1 m. 30. Les ailes supérieures ne sont pas très distantes du fuselage.

1) Les croquis ci-contre de pièces sont empruntés à Flight.

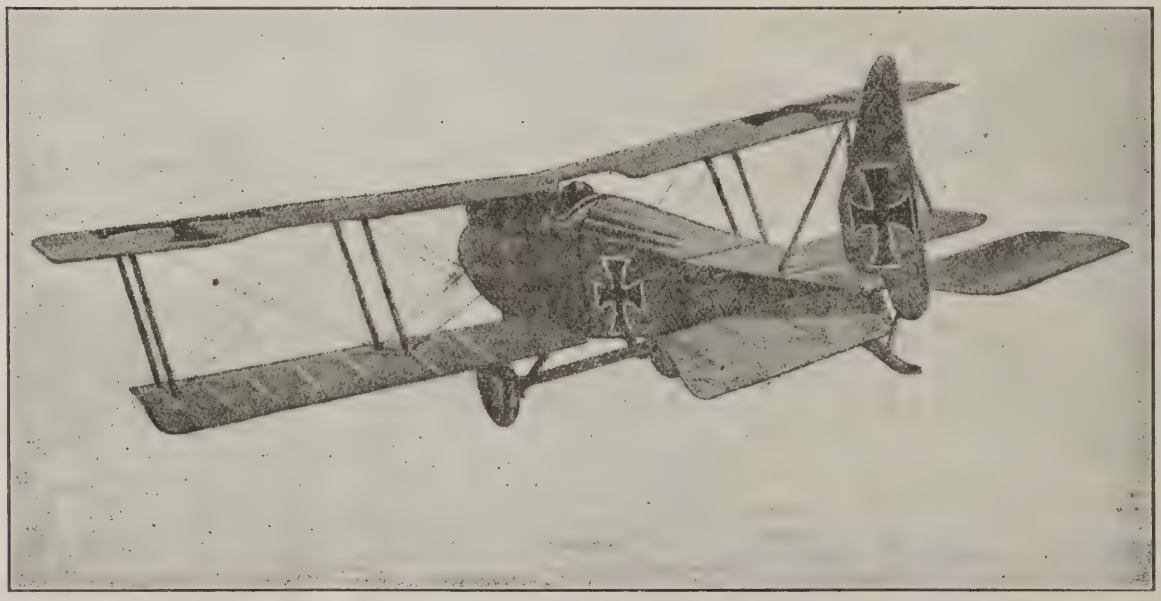


Fig. 9. — **BIPLAN HALBERSTADT DE CHASSE. — Ailes** en V. — **Gouvernail :** haut et pointu.

— 7 —

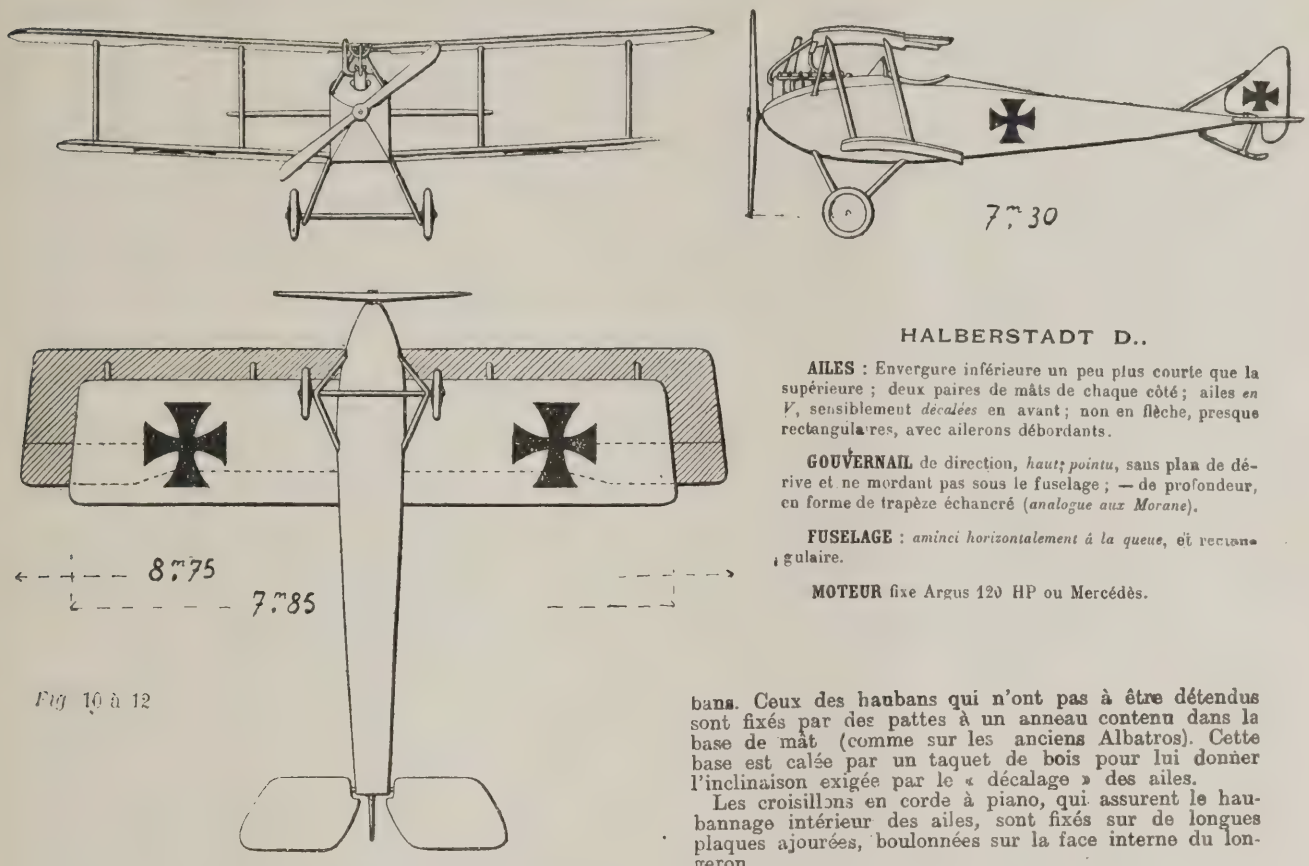


Fig 10 à 12

HALBERSTADT D..

AILES : Envergure inférieure un peu plus courte que la supérieure ; deux paires de mâts de chaque côté ; ailes *en V*, sensiblement *décalées* en avant ; non en flèche, presque rectangulaires, avec ailerons débordants.

GOUVERNAIL de direction, *haut; pointu*, sans plan de dérive et ne mordant pas sous le fuselage ; — de profondeur, en forme de trapèze échancré (*analogue aux Morane*).

FUSELAGE : *aminci horizontalement à la queue*, et rectangulaire.

MOTEUR fixe Argus 120 HP ou Mercédès.

Il existe entre les ailes, de chaque côté du fuselage deux paires de mâts (inclinés vers l'avant). Ces mâts en tube profilé, se terminent aux deux extrémités par une partie perforée et boulonnée entre les deux anses d'une ferrure fixée au longeron d'ailes et sur laquelle ils pivotent (fig. 13). De cette manière, le plan supérieur peut, par un mouvement de parallélogramme et sans qu'on ait à démonter les mâts, se rabattre sur le plan inférieur, pour faciliter le transport. Cette façon de procéder est d'autant plus avantageuse qu'elle n'entraîne pas forcément un déréglage : en effet, pour relâcher les haubans, comme l'opération le nécessite, il n'est pas besoin de dévisser de tendeurs ; il suffit de faire jouer le déclic des tendeurs-sauterelles (analogues à ceux des L. V. G.), qui relient la base des mâts à certains haubans. Ceux des haubans qui n'ont pas à être détendus sont fixés par des pattes à un anneau contenu dans la base de mât (comme sur les anciens Albatros). Cette base est calée par un taquet de bois pour lui donner l'inclinaison exigée par le « décalage » des ailes.

Les croisillons en corde à piano, qui assurent le haubannage intérieur des ailes, sont fixés sur de longues plaques ajourées, boulonnées sur la face interne du longeron.

Les longerons d'ailes sont du type courant à section en I.

Par eux la cabane est suspendue aux ailes supérieures dont la partie centrale est revêtue de contreplaqué. Quant aux ailes inférieures, leurs longerons se terminent par une ferrure en mortaise ; on attache l'aile au fuselage en appliquant cette ferrure sur le tenon qui déborde de l'extrémité d'une traverse du fuselage. L'assemblage est maintenu par une clavette de sûreté. Ce système, imité de certains avions français, tend à prédominer sur les avions allemands, car il est beaucoup plus simple et non moins rapidement démontable, et fabricable en plus grandes séries que les anciennes attaches complexes, spécialement combinées et adaptées pour chaque marque. (V fig. 14).

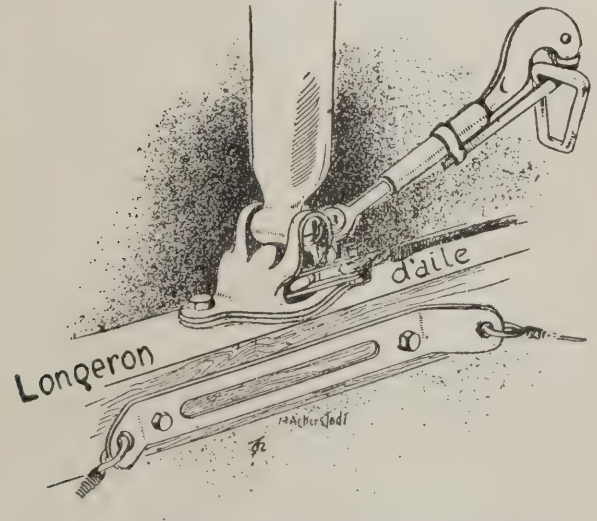


Fig. 13. — Base de mât d'Halberstadt. Tendeur à déclic (sauterelle) Attache de haubans. Attache de croisillons intérieurs.

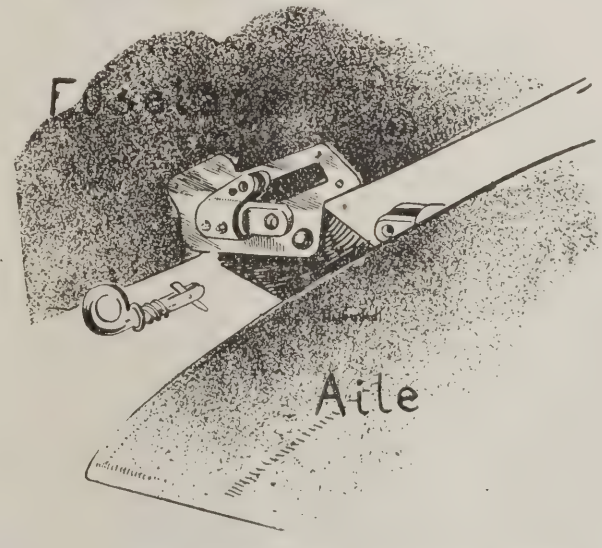


Fig. 14. — Attache d'aile inférieure d'Halberstadt au fuselage.

THE 170 HORSE POWER MERCEDES AVIATION MOTOR

By E. H. SHERBONDY

THIS motor is one of the five types standardized by the German War Office and is in very general use at the present time. Its maximum power is 176 h.p., at 1,450 r.p.m. This motor is of the fixed vertical type, has six cylinders in line, which are not off-set and is water cooled. The camshaft is carried in a special bronze case, seated on the immediate top of the cylinders, which in turn is driven by bevel gearing, a vertical shaft being interposed between the crankshaft and camshaft

The water pump is located on this vertical shaft and serves to steady the motion of this shaft. Extending immediately below the cam shaft is another vertical shaft, driven by bevel gears off from the crankshaft master bevel, terminating in a worm, which drives the multiple piston oil pumps.

Cylinders

The cylinders are made from steel forgings, as are the valve chamber elbows, which are machined all over and are welded together. A jacket of light steel is welded over the valve elbows and attached to a flange on the cylinder, allowing for a water cooling space, having a section of about 10 m/m or 7/16 of an inch. The bore of the cylinders is 140 m/m or 5½ inches, the stroke is 160 m/m or 6 5/16 inches.

The volume of the compression chamber is .645 litres, the cylinder capacity being 2 litres .463. The ratio volumes is 4.818. The cylinders are locked to the crank case by means of dogs and long through bolts, which have shoulders near their lower ends and are bolted to the lower half of the crank chamber. All this gives an exceedingly stiff and light structure, and the construction has been imitated by a great many other builders.

There are a number of peculiarities in connection with these cylinders which are well worth noting. In plate 3, which is a longitudinal section through the motor, the water cooling system will be clearly apparent. The water after leaving the water pump enters the top of the front cylinders and passes successively through each of the six cylinders. There are short tubes welded to the top of the water jackets which serve as a communicating gallery. This same system of cooling was used for years by the Panhard Company of Paris on their motor car engines. It has more recently been used in connection with the English White and Poppe Motor Truck Engines. Excellent circulation is had around the valve chambers and cylinder heads.

It will also be noted that a lug has been forged with the valve elbow, which serves as the anchor and steadiment for the camshaft housing.

Piston and Connecting Rods

The pistons are built up of two pieces. First—A dropped forged steel head, extending from which are the piston pin bosses and secondly, a cast iron skirt, into which this head is screwed. The skirt carries three rings at its upper end and one on its lower end. There are also a couple of lubricating oil grooves cut into this skirt.

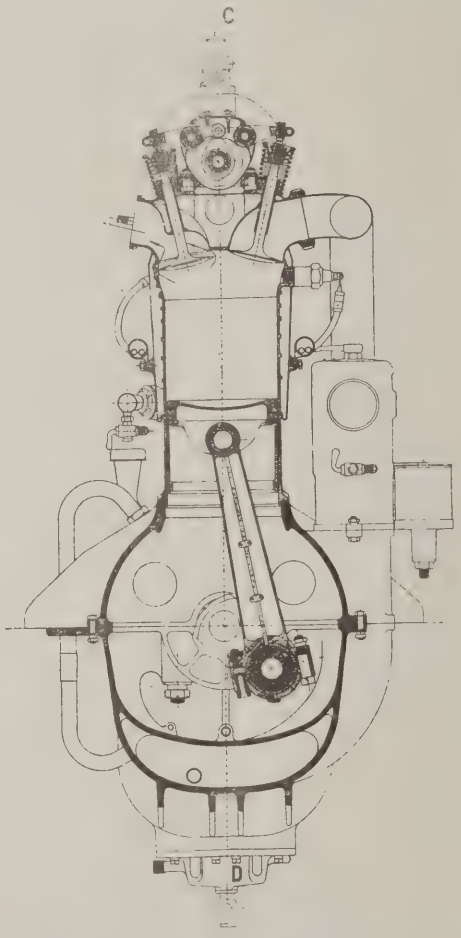
After the head has been screwed into the skirt it is retained by two small rivets and is welded at a couple of points. The co-efficient of friction between cast iron and steel is considerably lower than between two steel members, and there is less tendency for a cast iron piston to cut or score than where a steel piston is used. A great many makers have tried steel pistons and afterwards given them up and gone over to cast iron. For instance, in the original Gnome engines, steel pistons with a single brass ring were used. These were afterwards given up, and in all the Gnome engines now being built cast iron pistons, with a percentage of steel in the mixture, are the invariable standard. The LeRhone rotating engine, which has necessarily steel cylinders, has a cast iron liner forced into these cylinders for wearing surface.

There are also some distinct advantages possessed by this piston design. The skirt can be readily machined all over, and may have uniform wall thickness, which in itself greatly assists in preventing distortion. The piston pin is formed from a Chrome nickel steel tube and is retained in the piston by means of a simple set screw and cotter pin.

The connecting rods are very short and very stiff of I-beam section and are machined all over. At their upper end there is a floating bronze bush, which bears on the piston pin. Banded to the web of the rod is an oil tube for conveying lubricant from the crank pin to the piston pin.

The Crank Shaft and Its Mounting

The crankshaft is also a Chrome nickel steel member and is carried on seven bearings. There are holes through each of the crank pins and main bearings fully half the diameter of the shaft, which are plugged by pressed brass members. Small holes are drilled through the crank cheeks, which serve to convey lubricant from the main bearings to the crank pins. The propeller thrust is taken by a simple ball thrust bearing at the propeller end of the crankshaft. This thrust bearing is seated in a steel retainer which is clamped between the two



Cross section view of the 170 H.P. Mercedes motor

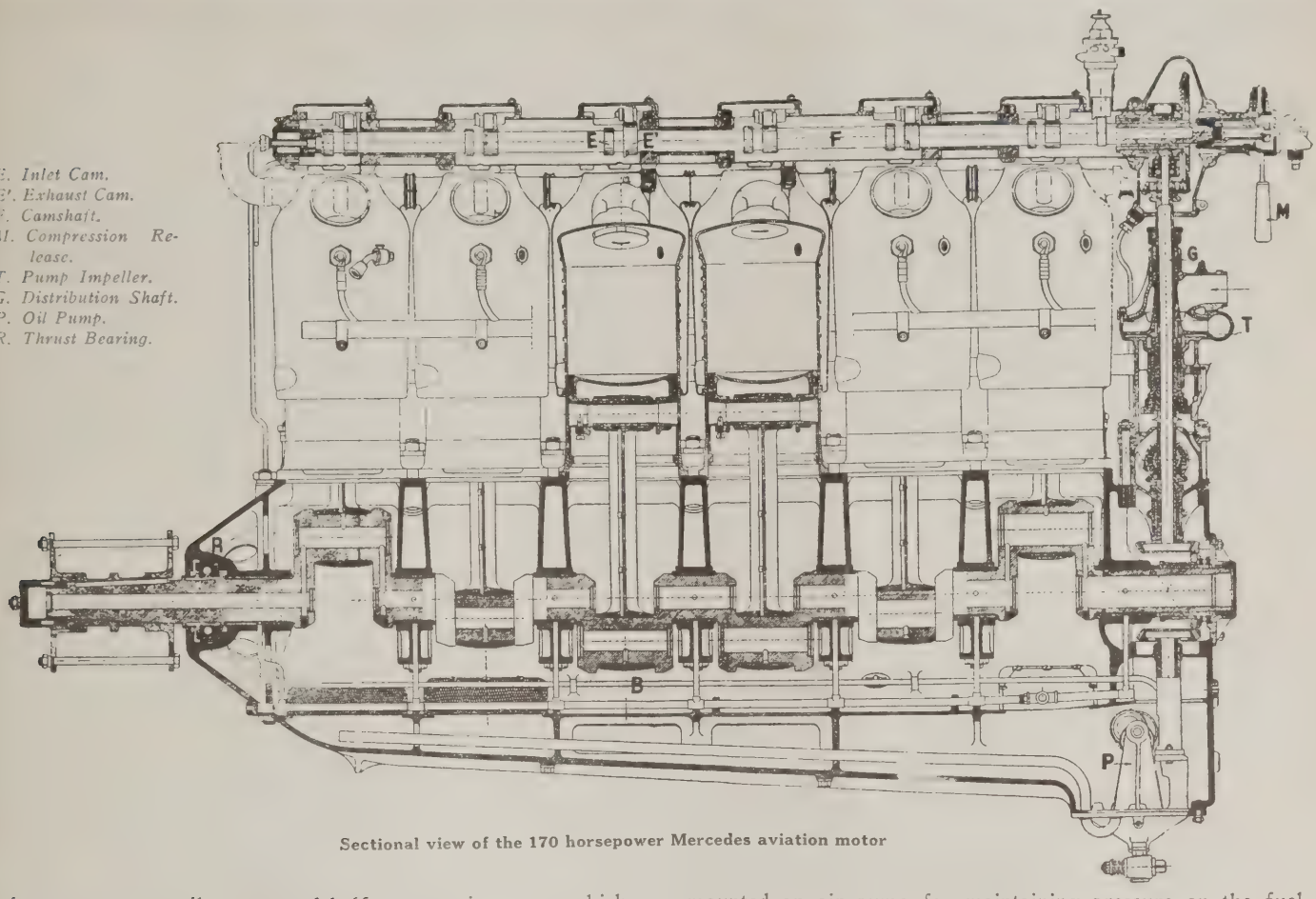
halves of the crank case. At the forward end of the crankshaft there is mounted a master bevel gear on six splines. This bevel floats on the splines against a ball thrust bearing and in turn this thrust is taken by the crank case cover. A stuffing box prevents the loss of lubricant out of the front end of the crank chamber, and an oil thrower ring serves the same purpose at the propeller end of the crank chamber.

The Operation of Accessories and Distribution

With a motor speed of 1,450 r.p.m., the vertical shaft at the forward end of the motor turns 2,175 r.p.m. This is also the speed of the two magnetos and the water pump. The lower vertical shaft bevel gear and the magneto driving gear are both made integral with the vertical driving shaft, which in turn are carried in plain bearings in an aluminum housing. This housing is clamped by means of three studs to the upper half of the crank case.

The camshaft carries 18 integral cams, the inlet and ex-

E. Inlet Cam.
E'. Exhaust Cam.
F. Camshaft.
M. Compression Release.
T. Pump Impeller.
G. Distribution Shaft.
P. Oil Pump.
R. Thrust Bearing.



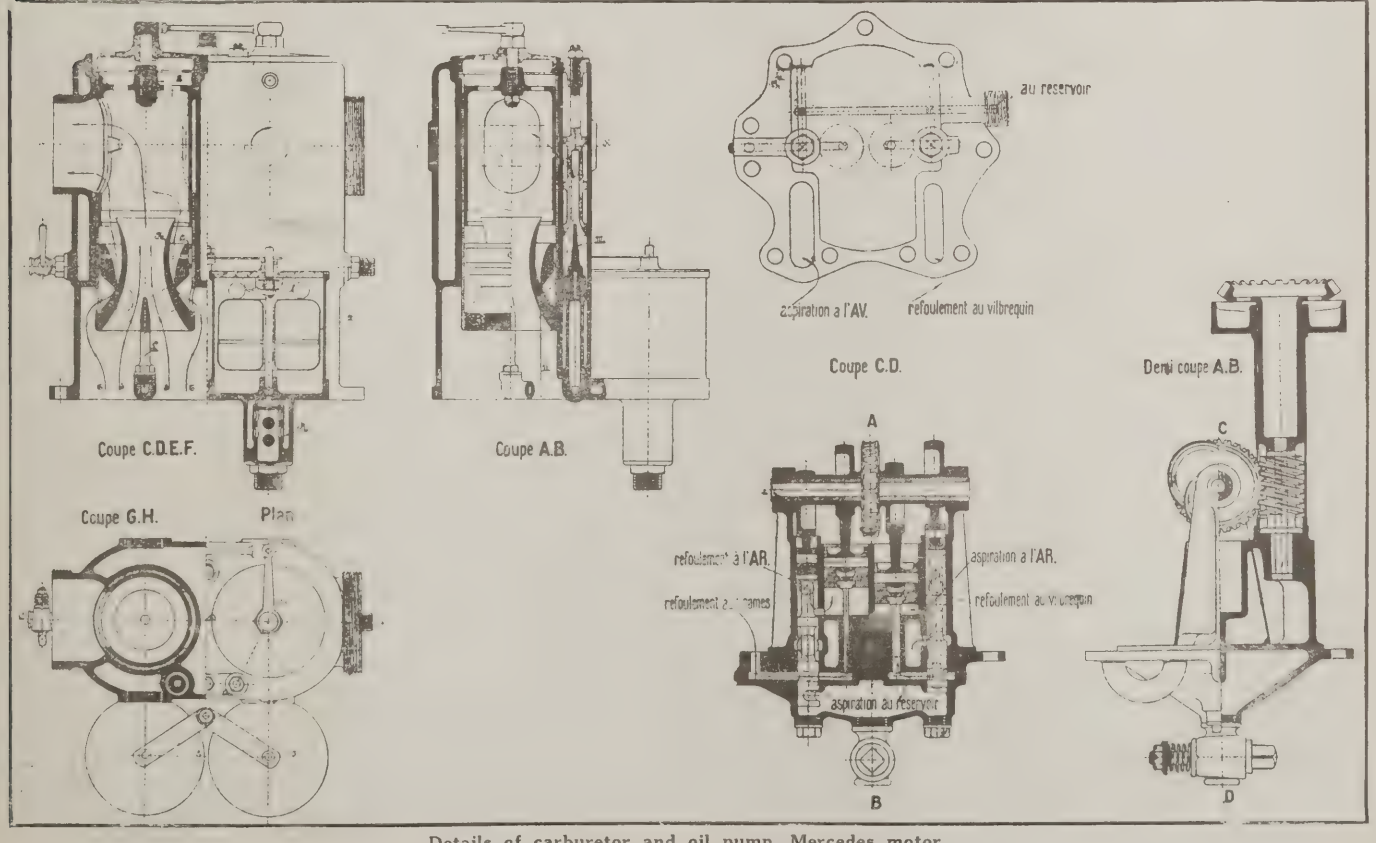
Sectional view of the 170 horsepower Mercedes aviation motor

haust cams, as well as a set of half compression cams, which are formed with the exhaust cams and which are put into action by means of a lever at the forward end of the camshaft. The camshaft bevel gear is fastened to the camshaft by means of multiple splines. Shaft is hollow, and serves as an oil gallery for conveying lubricant to each of the camshaft bearings. At the forward end of the camshaft there is also mounted an air pump for maintaining pressure on the fuel supply tank and a bevel gear tachometer drive.

The timing is as follows:

Opening of the inlet valves: 2½ m/m after the top dead-center on the piston stroke, or 14 degrees of crankshaft motion.

Closing inlet valves: 15 m/m on the up-stroke of a



Details of carburetor and oil pump, Mercedes motor.

piston or 36 degrees of crankshaft motion past the bottom dead-center.

Opening the exhaust valves 24 m/m before the bottom dead-center corresponding to 46 degrees of crankshaft motion.

Closing exhaust ½ m/m after the top dead-center for 4 degrees of crankshaft motion.

Lubrication

Lubrication is, of course, carried out by a full pressure system. The oil is pumped through a single manifold, with 7 branches to the crankshaft main bearings. Then in turn through the hollow crankshaft to the connecting rod big ends and thence through small tubes to the piston pins.

Plate 5 clearly illustrates the oil pump, which has 4 pistons and two double valves driven from a single eccentric shaft on which is mounted four eccentrics. The pump is continually submerged in oil. One of the large pumps draws oil off from the base and the other one pumps filtered oil to the bearings. In order to avoid great variations in pressure in the oil lines there is a piston operated pressure regulator, cut in between the pump and the oil lines. The two small pistons take fresh oil from a tank located in the fuselage of the machine. One of these pumps delivers oil to the camshaft and the other delivers oil to the crankshaft; this fresh oil mixes with the used oil and returns to the base and back to the main large oil pump cylinders. By means of these small pumps a constant quantity of oil is kept in the motor, and the oil is continually refreshed by means of the new oil coming in. All of the oil pipes are fastened into the lower half of the crank chamber very securely.

There is also some cooling of the oil affected by air passing through cast channels in the crank case on its way to the carburetor.

Exhaust Collector

A light steel manifold serves to connect the exhaust ports of each of the cylinders to central stack, which is inclined about 15 degrees from vertical and is arranged to exhaust just over the top of the upper wing of the plane.

Carburetor

On the left side of the motor two tubular manifolds, each in the form of a T, connect the cylinder inlet ports with the double carburetor. (See plates 4 and 6.) The composition of the mixtures is maintained normal by means of an automatic air valve surrounding the throat of the carburetor, and without springs. A small primary nozzle is arranged to take care of starting and idling conditions. The air for the mixture is supposed to have been heated by passing through the cast channels in the crank chamber, and while the small amount of heat thus added to the air might assist in the carburetion of very light fuels, it is quite probable that considerably more heat would be required with American gasoline. The carburetor body itself is water-jacketed.

Ignition

The ignition is furnished by two Bosch Z-H-6 magnetos, which operate at a speed of 2,175 turns when the motor is up to normal speed. The maximum advanced position for the ignition is 12 m/m or 32 degrees before the top dead-center. Bosch plugs with steatite insulators are used. The firing order is 1, 5, 3, 6, 2, 4.

Radiator

There is also included with this motor a radiator, which, together with the water-jackets, has a capacity of 25 litres of water. This radiator is rectangular in shape and is normally tilted at an angle of 30 degrees from vertical. The tubes are 125 m/m long. With the radiator is 835 m/m, and it is 186 m/m high. In this form it presents but a small amount of head resistance. Its weight is 26 k.g.

200 H. P. Mercedes Motor

In addition to the motor just described there is another motor with the same size cylinders, which, however, has eight cylinders and employs speed reduction gear, so that the propeller only turns at 900 r.p.m. This type of motor has been used extensively in the L. V. G. battle planes.

Tabulated Characteristics of a Mercedes Motor—6 Cylinders—170 H. P.

Bore	140 mm.
Stroke	160 mm.
Space occupied	1500 mm.
Width	500 mm.
Height	1005 mm.
Weight of the motor without accessories	273.22 kg.
Weight of motor, with carburetor, 3 magnetos, radiator and exhaust pipes	306.72 kg.
Displacement of 1 cylinder	2.463 L
Displacement of all cylinders	14.778 L
Volume of compression chamber	645 L
Total volume of the cylinder	3.108 L
The compression pressure	4.818 kg. per Cm^2
Thickness of the cylinder wall	3.5 mm.
Weight of 1 bare cylinder	8.34 kg.
Weight of one complete cylinder	10.206 kg.
Weight of the bare crankshaft	32.2 kg.
Weight of the complete crankshaft	32.2 kg.
Diameter of the main bearings	56 mm.
Diameter of the crank pins	54 mm.
Number of crankshaft bearings	7
Weight of the conecting rod	2.31 kg.
Length of connecting rod centers	290.5 mm.
Weight of the bare piston	2.5 kg.
Weight of the complete piston	3.11 kg.
Length of the piston	121 mm.
Area of the piston	153.938 Cm. square
Number of rings	4
Width of the rings	5 mm.
Gap between the ends of the rings	1/10 mm.
Ring material	cast iron
Diameter in the piston pin	32 mm.
Mean speed of the piston at 1200 R.P.M. Meters per second	6.4
Maximum speed of the piston at 1200 R.P.M. Meters per second	10 M
Diameter of the valves, throat 68 m/m: outside	72 mm.
Width of the valve seats	3 mm.
Diameter of the valve stems	12 mm.
Clearance between the rocker arm end and the valve stem	1 4/10 mm.; E 3/10
Maximum lift	10 mm.
Total length of the valve	153 mm.
Weight of one bare valve	452 Gr.
Weight of one complete valve	520 Gr.
Weight of the camshaft bare	5 kg.
Weight of the camshaft complete with casing	21. 1/10 kg.
Diameter of the camshaft	25.5 mm.
Diameter of the cam base circle	34 mm.
Diameter of the cam clearance circle	42 mm.
Diameter of the relief cam clearance circle	36 mm.
Diameter of the inlet ports at manifold connection	54 mm.
Diameter of the exhaust ports at manifold connection	54 mm.
Diameter of the inlet pipe	53 mm.
Mean gas velocity at 1200 R.P.M. in meters per second	45 M
Weight of the lower half of the crank case	39.970 kg.
Weight of the upper half of the crank case	31 kg.
Weight of the carburetor	6.6 kg.
Weight of the exhaust collector	7.5 kg.
Weight of the radiator empty	26 kg.
Weight of the radiator filled	40 kg.

Recapitulation of the Weights of Mercedes Motor

Crankshaft complete	34.8 kg.
Lower half of crank case	39.97 kg.
Upper half of crank case	31. kg.
Six cylinders complete	61.24 kg.
Six conecting rods complete	13.86 kg.
Six pistons complete	18.7 kg.
Camshaft complete	21.1 kg.
Carburetor	6.6 kg.
Water pump with shaft and housing	6.6 kg.
Oil pump with shaft	5.85 kg.
Two operating magnetos	13. kg.
One starting magneto	4. kg.
Inlet pipe and ignition wire casing	11. kg.
Miscellaneous parts	5.5 kg.
Total	273.22 kg.
Exhaust pipe complete	7.5 kg.
Radiator empty	26. kg.
Total	306.72 kg.



MILITARY AEROSTATICS



COOPERATION BETWEEN BALLOONS AND ARTILLERY

By Major D. RAINSFORD HANNAY, Royal Flying Corps, British Army

IT is a very well-known axiom in war that the closest coöperation between the various arms is necessary to secure the best results; and, when it comes to the question of captive balloons observing for artillery, the more that each unit knows about the methods of, and the difficulties experienced by, the other the better.

I propose, therefore, to describe the working of a balloon section of the British Army in the field.

As regards organization, the balloon service of the Royal Flying Corps is divided into wings, companies, and sections. A section consists of four officers and 90 men and works one balloon. A company consists of two sections. A wing consists of all the companies in any one army.

The balloon now in use in the field is a streamline balloon, the invention of Captain Caquot, of the French Army. It has a cubic capacity of 950 cubic metres and is capable of lifting two observers to a height of 4,000 feet. Each section is provided with a mobile winch, the engine of the winch being quite separate from the engine of the truck on which the winch is mounted. Theoretically, the balloon should be let up from the ground at a considerable distance behind the lines and then run forward on the winch with the balloon high up in the air; but, in practice, it is found that there are very few roads left near the lines which are fit for a heavy truck, and, even if one is found, it is probably too congested with traffic. Owing to these reasons, the majority of balloons, in France, are stationary, at an average distance of about 6,000 yards behind the line. Where sections have been able to move their winches forward, they have got within 4,000 yards of the front line.

As regards observation of fire, the work of the balloon observer is chiefly with the heavier pieces of artillery, such as the

6-inch howitzers and the 4.7-inch guns,
8-inch howitzers and the 60-pounder guns,
9.2-inch howitzers and the 6-inch guns,
12-inch howitzers
15-inch howitzers

In the earlier days of the war, when there were fewer heavy batteries, balloons used to observe for Field Artillery; but, owing to the great increase of the howitzer batteries, and, also, to the somewhat altered rôle of the Field Artillery, very little work is done with them nowadays. In order to avoid confusion, Field Artillery in the British Army consists of only 18-pounder guns and 4.5-inch howitzers.

The balloon section is connected by telephone to all the batteries with which it is likely to work. The sketch gives a typical communication scheme of a section in the field. The upkeep of the telephone service is most important, and it is necessary that batteries should give as much mutual assistance as possible. Unless the lines are working well, the balloon might as well be on the ground, for all the good it can do. An advantage which a balloon has over an aeroplane, and one that compensates for a great many of the disadvantages, is the fact that the observer in the basket can talk direct by telephone to the battery commander on the ground, and does not have to confine himself to a limited code as used on the wireless. To refer to the sketch, all the telephone lines, shown, with the exception of those to Corps Heavy Artillery Headquarters, are the shooting lines of the section, and are used only when observing for, or when arranging shoots with, batteries. Lines lead from the balloon camp exchange to an advanced exchange which is placed in a central position among the batteries. Now when the balloon is in the air, it is connected by a telephone cable to the winch, which is, in turn, connected by aerial line to the camp exchange, and, tapped in on this line, is the chart room of the section, where all the map work and the arranging of shoots with batteries are done.

I have purposely enlarged on the communications of a section for this reason: although the greater part of the lines are laid by the signal companies, when once laid, the balloon section is responsible for their upkeep, and it will be seen, on referring to the sketch, that it is a pretty big job for the small telephone detachment allotted to a balloon section. Therefore it is of the greatest help when batteries assist, as much as is in their power, with the laying and maintenance of the line from their position to the advanced exchange (see Fig. 1).

The work chiefly allotted to the balloon consists of:



A Cacquon balloon, used by the Allies for spotting artillery fire. Official photo.

1. Destruction of villages;
2. Destruction of strong points behind the line;
3. Registering on cross roads:
4. Registering on exits from villages, woods, and ravines;
5. Counter-battery work.

The method of observation employed it to observe on the line balloon-target, and, by the use of graticuled glasses, to send to the battery such observations as

1°20′ Right,
30′ Left,
Line and over,
Line and short.

(*Continued on page* 343)



The type of winch used by the aeronautic section of the French army.

FOREIGN NEWS

BELGIUM

British Headquarters in Belgium, Oct. 22.—British aviators recently have attacked the Germans in their trenches at point blank range while the enemy aeroplanes remained inactive. Reports from captured officers are to the effect that the German fliers do not put in an appearance while "the English come and fire on us in our trenches, from a height of 50 meters" (55 yards).

One day recently nine British airmen came back, having fired 10,000 rounds from their machine guns at the men in the trenches and shell holes or moving along the roads. Air fighting lately has been severe and the Germans have been flying in large squadrons.

The official statement on aviation activities issued Oct. 27 by the War Office says:

"On Friday rain fell most of the day; but in spite of this our aeroplanes went out and performed valuable work in locating our attacking infantry and reporting suitable targets to our artillery. Our aeroplanes, flying at a low altitude, fired 10,000 rounds from their machine guns on hostile troops that were endeavoring to repair wire entanglements, on the enemy's horse and mechanical transports on the roads, and on enemy infantry on the march and in shell holes.

"Two of our machines flew down the main street of a town at the level of the housetops, firing at bodies of hostile troops."

FRANCE

Paris, Oct. 23.—Official examination of the crews of the Zeppelins captured in France while returning from the raid over England shows that the expedition consisted of thirteen airships, which left singly from three depots on the night of October 19. The raid was expected to last from twenty to twenty-five hours.

The raiders made for the English coast, which was recognized by lighthouses. They were hampered considerably by the fire of British anti-aircraft guns and by numerous searchlights, which caused them to drop almost all their bombs when sailing at a height of more than sixteen thousand feet.

They were caught by a strong northeasterly wind, and when they attempted to return to their bases their speed was slackened by the persistent headwinds. At dawn the L-49—the airship which fell intact into the hands of the French—dropped to a lower altitude, her commander believing he was over Holland or Westphalia. The crew waved white flags.

It was not until after eight o'clock in the morning that the commander became certain he was over France, and at the same time the Zeppelin was sighted by French aeroplanes, which forced it to land.

A little later the L-50 passed over the L-49, which was then on the ground surrounded by the French aeroplanes. The L-50 maneuvred for a landing in a neighboring wood, to give the crew as good an opportunity as possible to save themselves, but one car was torn off. Part of the crew escaped by means of parachutes. The car afterward was destroyed by means of special pistols firing inflammable charges.

The L-49 and L-50 belong to the super-Zeppelin class, measuring 650 feet. Their volume is 55,000 cubic metres. The crews are made up mostly of petty officers who have undergone a special course of instruction. They were clad warmly in furs and leather garments.

Bourbonne Les Bains, France, Oct. 23.—The L-49, the only Zeppelin to fall into the hands of the Allies intact, struck its colors to the shot-gun of a local workman named Boiteux Lieutenant Lafarge, of the "Crocodile" Escadrille, winged the Zeppelin, forcing it to land.

About half-past nine o'clock Saturday morning Boiteux was walking in a field with a dog and gun when he heard the sound of motors. He looked up, and saw the Zeppelin surrounded by aeroplanes, which were peppering it. The monster was flying very slow and very low. Suddenly the bows dipped into a clump of trees and the airship came to a standstill, subsiding gently across a narrow ravine in the bottom of which runs a brook.

"Immediately," said Boiteux, "the nineteen men of the crew clambered to the ground. The last to leave, who I afterward found was the captain, lined them up in good order and said something to them, probably his last instructions. He then fired a pistol into the envelope.

"I at once grasped that he intended to set fire to the Zeppelin and determined to stop him at any cost. I was about thirty yards away from him. I loaded my gun with buckshot and shouted:—

"Stop that or I will do some shooting."

The threat was enough. The captain dropped his gun, threw up his hands and cried 'Kamerad! Kamerad!' The men remained perfectly quiet covered by my gun until a crowd collected, when they were put under a good guard. The captain seemed furious at his fate, but seemed enchanted with the adventure."

General de Castelnau and Mr. Dumesnil, Under Secretary for Aviation, who saw the Zeppelin Sunday morning, congratulated Boiteux on his presence of mind and enterprising courage which preserved the airship, which will be a fruitful source of study for French aeronautical experts. He will be given suitable recognition by the government.

Toulon, Oct. 27.—In addition to the four Zeppelins known to have been lost by the Germans in French territory last Saturday, another has now been reported destroyed by falling into the Mediterranean.

Two French naval aviators made this report on Oct. 27. The Zeppelin sank forty miles south of the Hyeres Islands.

GERMANY

Germany has sent about fifty Turkish and Bulgarian aviators to Ostend for active service in the German Aircraft Corps, according to advices which have reached Washington from Switzerland through a diplomatic channel. These flyers have had a course of training in flying schools in Germany.

As Ostend is to be their base of operations, it is expected that they will be utilized with the German forces in the Flanders campaign and in future air raids over England.

Berlin, Oct. 26 (via London).—If the allies, and England in particular, hope by bombing unfortified German cities to bring Germany to her knees, that hope is vain, according to the belief expressed in the highest official quarters to-day.

The United Press was told on highest authority that the entente should not forget that there are numerous French cities in easy reach of German bombing airfleets if the allies, including America, carry out any programme of attack on open German towns.

This same authoritative source declared:

"The British press tries to comfort the British population with assurances that at the beginning of the winter cessation of the Flanders battle English air fleets, aided by numerous new English, American and Italian planes will bombard fortified and unfortified German cities.

"We know the allies are incapable of an increased air offensive.

"First, on account of bad winter climatic conditions in central Europe.

"Second, if the conclusion of the Flanders offensive releases British planes it will likewise release German planes.

"Third, according to entente prisoners in our hands America is not in a position to send many machines—even by next spring.

"Fourth, the hasty training of English fliers will make their losses four to one of ours, a fact proved by official casualty lists. Moreover, American fliers are also training hastily en masse, which is likely also to increase the disparity of losses.

"Fifth—Our home defense is of proved ability—for instance, on the occasion of recent French raids.

Berlin, Oct. 28.—Air squadrons of the Entente raided industrial districts in Lorraine and Luxembourg the night of Oct. 24-25. Five persons were killed and four injured at Esch, while one was killed and six injured at Saarbrucken. The statement says:

"No military damage was done and the material damage was insignificant. Four aeroplanes were shot down by anti-aircraft fire or forced to descend."

GREAT BRITAIN

London, Oct. 24.—In the course of his weekly talk with The Associated Press today Major Gen. Frederick B. Maurice, Chief Director of Military Operations at the War Office, discussed the work of British aeroplanes on the west front. He said:

"During September our bombing machines made 226 raids, dropping on the Germans 7,886 bombs, representing 135 tons of explosives. In the same period the Germans dropped almost exactly 1,000 bombs on the British. Now, bombing is only a part of our air operations. By far the most important work of the airmen is the direction of the artillery.

"During September we made 7,964 'shoots' at enemy batteries under aerial observations, and silenced them in 1,813 instances. During the same period the Germans only succeeded in ranging on 743 of our guns.

"During September we engaged and brought down 274 enemy planes, and this figure errs on the side of conservatism, for our headquarters never allows airmen credit for a victory unless the fall of an enemy is corroborated from either an observer on the ground or another airman in the vicinity."

London, Oct. 28.—British aerial attacks on German military establishments in Belgium were continued actively on Friday night and Saturday. An official report today indicates that considerable damage was caused. The announcement follows:

"Bombs were dropped on Friday night by the naval air service on the Lichtervelde railway junction, direct hits causing a heavy explosion followed by numerous smaller ones. The Thorout railway junction also was attacked, bombs falling close to a moving train, which stopped immediately, a large explosion being observed. The Cortermarck railway junction also was bombed.

"On Saturday afternoon bombing raids were carried out on the Sparappelhoek airdrome, the Engel airdrome and the Ostend-Thorout railway line south of Engel."

HOLLAND

Rotterdam, Oct. 22, (Dispatch to The London Daily Telegraph).—Movements of Zeppelins observed from the Dutch coast during the early hours of yesterday supplemented evidence from France as to the complete breaking up of the squadron which raided England.

On their westward journey all the airships could be seen in organized formation. Eight passed in regular order escorted by seaplanes.

Very different was the return journey. From various places come reports of three Zeppelins, each on its own course but all hopelessly out of their bearings and apparently depending on guesswork to make their return to Germany. Two violated the neutrality of Holland and both were fired upon by the Dutch defenders.

Amsterdam, Oct. 24.—It was a combination of wind and fog which made it impossible to take bearings that enabled the Allies to bring down such a large number of German Zeppelins last week, according to the Lokal Anzeiger.

Berlin despatches today quoted the newspaper as emphasizing that the English aviators and anti-aircraft guns failed utterly to bring the dirigibles down.

SWITZERLAND

Zurich, Switzerland, Oct. 23.—Friedrichshafen is in mourning over the loss of at least four Zeppelins in the last raid on England, according to advice received here from Swiss towns on Lake Constance. The majority of the crews of the destroyed Zeppelins lived in Friedrichshafen, where they received their training. The King of Wurttemberg has sent messages of condolence to the families of the men lost in the raid.

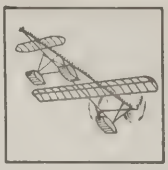
The Swiss Newspapers express the opinion that the disaster in France is a blow to aircraft of the Zeppelin type.

The newet Zeppelins, according to information received here, are 760 feet long and 78 feet diameter. They have eight engines developing 2,000 horse-power and are able to keep in the air fifty hours with a crew of twenty men and a load of projectiles.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th St., New York City
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
LONG ISLAND MODEL AERO CLUB
401 Grant Ave., Cypress Hills, L. I.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

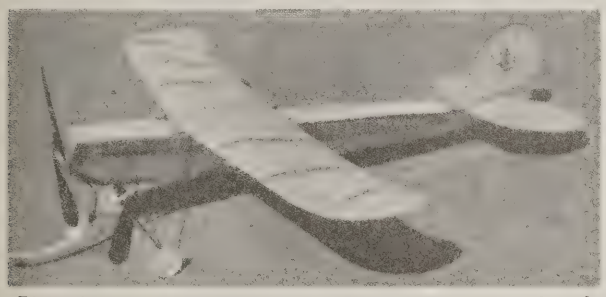
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

A Successful Tractor

The following particulars which Mr. W. G. Pinney of Glasgow sent to "Flight" should be of interest to our own "Model" readers:

"The large C. A. model is fitted with an autoplan engine and air container. Two stout *longerons* run along the sides of the container, and to these are attached the planes, tail, and chassis, in order to keep the engine and container free from stresses. The main planes are built with 18 gauge steel wire and double surfaced. The wing spars were originally of an I section, but they were far too frail, and I now use hollow spars of a square section.

"This model has only been out once, and then it did long hops of about 10 yards. This was probably owing to the fact that the temperature was only 57° F., causing the engine to run badly. However, I am confident that this machine will make some good flights in warmer weather.



Mr. Pinney's successful rubber-strand driven tractor monoplane having a 31 sec. duration record.

"The tractor biplane has only just been built, and the top of the *fuselage* is still uncovered to allow for the main planes being fixed correctly by actual flying tests. The *fuselage* is formed of four *longerons* separated by ⅛ in. maple formers. The forward part is enclosed by thin aluminium sheet, while the rest is covered with Jap silk doped with Cellon. The motor has two skeins of rubber geared with Bonn's $^{11}/_{16}$ in. gear wheels. A small celluloid window is fitted underneath the engine cowl for the examination of the rubber hooks, etc. The chassis is of the Avro type with a wooden skid laminated with 15 gauge steel wire. The wheels were fretted out of ¼ in. satin walnut, with three spokes, and covered with Jap silk. The main planes are built of 20 gauge steel wire covered with Jap silk doped and varnished. The interplane struts are of satin walnut and braced diagonally. The propeller is 14 ins. diameter.

"The result of a few glides indoors is very promising, the gliding angle being about 1 in 5½ or 6. Considering the weight is 14 ozs., this seems quite good.

"The small monoplane shown in the illustration was described in 'Flight' last year. The *fuselage* of this machine was originally enclosed, but the silk has been removed owing to its deterioration. The maximum duration of this model is 31 seconds to date."

Mr. Jenkins' Views on Scale Models

Mr. Edwin A. Jenkins, of Brooklyn, writes us as follows:

"In my opinion the exact scale model is just the thing for those who live in large cities such as New York, where there is little or no available space for flying racing models.

"Another advantage of the scale model is that it teaches the builder the principles of aeroplane construction which may be of use if the builder has any ambitions in the aeronautical line. Also a scale model can be made as elaborate as one pleases while a racing model must be trimmed down until there is no resemblance between it and the genuine machine.

"Building scale models is also profitable if one wishes to make it so. I have heard that stores will pay for the privilege of keeping a scale model in their window as a finely built model acts as a magnet to draw attention.

"And last but not least, a scale model is an ornament which one can be proud of especially if it is of your own handywork."

A Model Warplane

By Theodore Hodgon

This model represents a scale model of the once famous Etrich Taube.

The fuselage consists of a paper tube, braced with cardboard discs, and with cork ends. The total length of the fuselage is 20 inches, including the tail-plane.

The wing-spread is 24 inches. The tail-plane is composed of 5 ribs, while the main-plane contains 12 ribs, attached to a main spar. Paper is used to cover the planes.

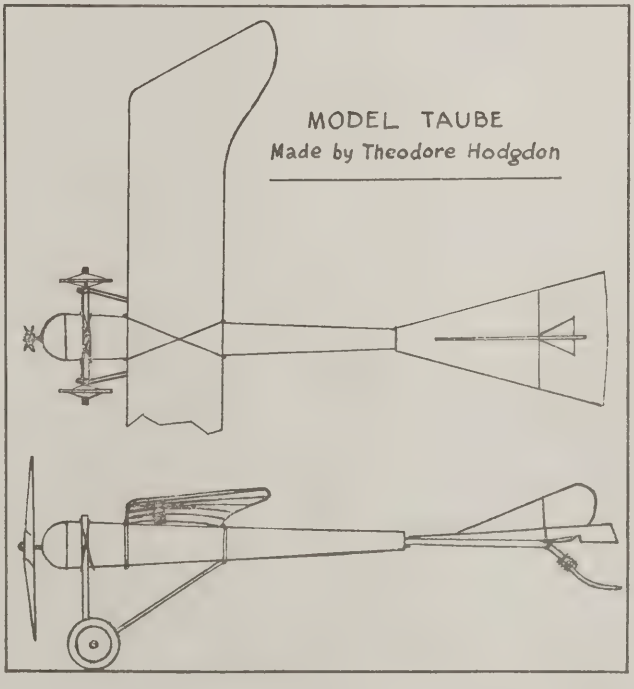
The power plant consists of 12 strands of 1/16 inch rubber driving a seven-inch poplar propeller (tractor).

As the drawing shows, the tail-plane is not directly attached to the fuselage, but is attached to a strip of bamboo, running the entire length of the fuselage. This strip also serves as a tail skid.

One interesting feature of this model is the opening in the elevator to allow for the movement of the vertical rudder.

The wheels are composed of roofing-tins, with cardboard discs in between. This produces a very effectively streamlined wheel.

The main plane and the inverted U for the landing-gear are secured to the fuselage by thread, as the accompanying drawing shows.





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

When "U" Is "V"

Why do some modern architects assvme that U is V are carve in stone that palpable and bold absurdity?

Now that we possess the U, with soft and gracefvl cvrve, of vnexcelled docility and willingness to serve, why do they carve VNITED STATES and PVBLIC SCHOOL and svch and make the English langvage look as fvnny as the Dvtch, with RESTAVRANT and PVLLMAN CAR and VNIVERSITY, and other marks of edvcational perversity?

That V impresses some of vs as cheap and gavdy blvff, which parvenves may pvll in place of more svbstantial stvff, bvt people who are fashioned ovt of vnpretentiovs dvst, view all svch affectation with an vnassvmed disgvt. Svch exhibitions always make vs glvm and blve. Now, honest Injvn, don't they have the same effect on yov?—*Printer's Ink.*

When I was in the library the other day, an elderly gentleman approached me and asked very courteously if I would tell him where he could find the waiting room. "Waiting Room?" I exclaimed in surprise. "Why," he queried, "isn't this the Grand Central Station? I want to take a train to Albany."

"Why," I said, "this is the New York Public Library. The only train you can take here is a train of thought—or flight of imagination."

NOTE: Don't blame us for the above joke. It's the property of Mr. Augustus Post.

Cause and effect. The modern way.

Pekin, Saturday, 11.50 *a.m.*

"An aeroplane dropped bombs on the Palace to-day,"

Pekin, Saturday, 7.40 *p.m.*

"General Chang-H'sun, who is much depressed by the bombing of the Palace and the failure of his coup, has tendered his resignation to the Emperor."

"The Emperor of China has abdicated."—*Reuter.*

One French air raider is credited with destroying one-eighth of the Krupp works. Why not send seven more French aeroplanes?—*The Curtiss Fylial.*

"John, you ought to get in the aviation service," a York man told a negro last week. "You are a good mechanic and would come in handy in an aeroplane. How would you like to fly among the clouds a mile high and drop a few bombs down on the Germans?"

"I ain't in no special hurry to fly, Cap," the negro answered. "When we's up 'bout a mile high, s'pose de engine stopt and de white man told me to git out an' crank?"—*York News.*

Mr. Saphead: "On my army application there is a place to tell the condition of the mind. What would you advise me to answer?"

Miss Kutting: "Leave it blank."—*Judge.*

Emma: " An' wot der they sye, Bert, 'ter live?' "

Bert: "Vivre."

Emma: "An' wot's 'ter die?' "

Bert: "Aujoordwee."—*Sketch.*



"Do you think the time is coming when the government will commandeer all privately owned aeroplanes?"

"I don't know," replied the melancholy aviator, "but if the government wants to beat the sheriff to mine it will have to hurry."

Mr. Smith wasn't an expert mechanic, and even the mention of aviation roused all his fighting spirit. "Did you make this aeroplane?" asked the foreman. "Meaning no harm, I did," said the mechanic, preparing for a skirmish. "It is smaller than usual," replied the foreman. "That's so you will have less to find fault with."

One day an aviator was droppin bombs on an encamping of negro soldiers, bombs were bursting and splinters and whole shells were flying everywhere. The atmosphere was full of smoke and resounding with whines. Out of a shack came a darky loaded to the waterline with kit, blankets, rifle, etc,, and up the road he dangled. Here! Where are you going? shouted an officer. I ain't goin' suh, panted the darky, I'ze gone.



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MARBLEHEAD, MASS.

Sole Licencees for the United States for the Dunne Patents

Members of the Aircraft Manufacturers Association

(*Continued from page* 339)

Artillery officers will fully realize that it is not advisable to give observations as regards range until the battery drops a shell fairly close to the balloon-target line. Then, when the observer is able to check the range, the battery commander will register by the bracket system, always remembering that to keep his shells falling on the line balloon-target it will be necessary for him to give deflection for each increase or decrease in the range ordered on the guns. This deflection varies acording to the size of the apex angle in the triangle balloon-target battery.

The chief object of the observer is to describe to the battery commander briefly, but clearly, the position of each shot. This can frequently be done with reference to surrounding objects in the vicinity of the target which are shown on the map. For instance, even when a shot does fall wide of the target, it may be possible to check the range owing to its falling short or over some other object on the map, such as a road, stream, small wood, etc. Here the observer would give such an observation as, "40′ right and short of the small wood N. E. of the target." Such information at this is, of course, very valuable to the batery commander, as he can alter his range and deflection at the same time and thus save both time and ammunition.

I will try and describe a typical shoot on a fixed target, let us say the southern exit from a village including the houses on each side of the road. The night before the O. C. Balloon Section No. 24 (code word HAWK; code words are always used when telephoning near the lines in France) arranges to observe for No. 64 Siege Battery, 12-inch howitzers on railway mounting (code word BRASS) on the southern extremity of the village of Longueval, as soon as visibility permits (see Fig. 2). When the balloon goes up, and the observer is ready, and can clearly see the target, he sends the following information through the chart room to the battery:

1. Position of balloon. This is done by dropping a small plumb line about 20 feet long over the side of the basket and noting the exact spot over which the basket is hanging.
2. Height of ballon in feet.
3. Strength and direction of wind.
4. When he is ready to observe.

He should also arrange with the battery commander as to the exact reference point from which he will give his observation. In this case he will probably use the spot where the road joins the houses of the village.

The battery will then send to the balloon:

1. Time of flight of shell.
2. Nature of projectile. In this particular case there can be no question, as a 12-inch howitzer fires only high explosives.
3. When they are ready to fire.

When both observer and battery report they are ready, the battery will send, "Stand by," and the observer will then give, "Ready." As soon as "Ready" is received by the battery, the guns will be fired at once and "Gun fired" will be sent to the balloon.

Air Navigation for Flight Officers

In a preface dated from the Navigation School, Portsmouth, the author announces that officers in the Royal Naval Air Service will find condensed in the volume all the subjects in navigation they are required to know. The student of aeronautics, and especially the average reader, will therefore doubtless find the discussion sufficiently detailed. The action of magnetism is first discussed as a preliminary to the explanation of the compass, and especially the distinctive features of the aeroplane compass. The analysis and adjustment of deviation is taken up and illustrated in detail. Practical instructions are given for correcting a compass, the best method of swinging, correcting courses and getting the correct angle from the bearing tables. There are helpful chapters on meteorology and forecasting by a solitary observer, and various phases of astronomy essential to air navigation. Much information will be found concerning admiralty charts and conventional signs and symbols used on them, the method of fixing positions and the value of ordnance means to air pilots.

For sale at The Aeronautic Library, 280 Madison Avenue, New York City, price $3.00.

Frolics High in the Air

Camp Mills.—Lieutenant Balderolio, of the Italian Aero Corps, kept the men of the Rainbow Division with their noses pointed skyward for more than an hour on October 20, while he frolicked among the clouds in his swift Pompilio scout machine.

Even the army officers who had come to witness the flight, declared at its conclusion that it was the most remarkable performance they ever had seen. The young Italian looped the loop, dropped nose or tail first for hundreds of yards, only to soar up again when close to earth, and finished his demonstration with a dive of 3,000 feet. Then he brought his machine gently to earth, only a few feet from where the observing officers stood.

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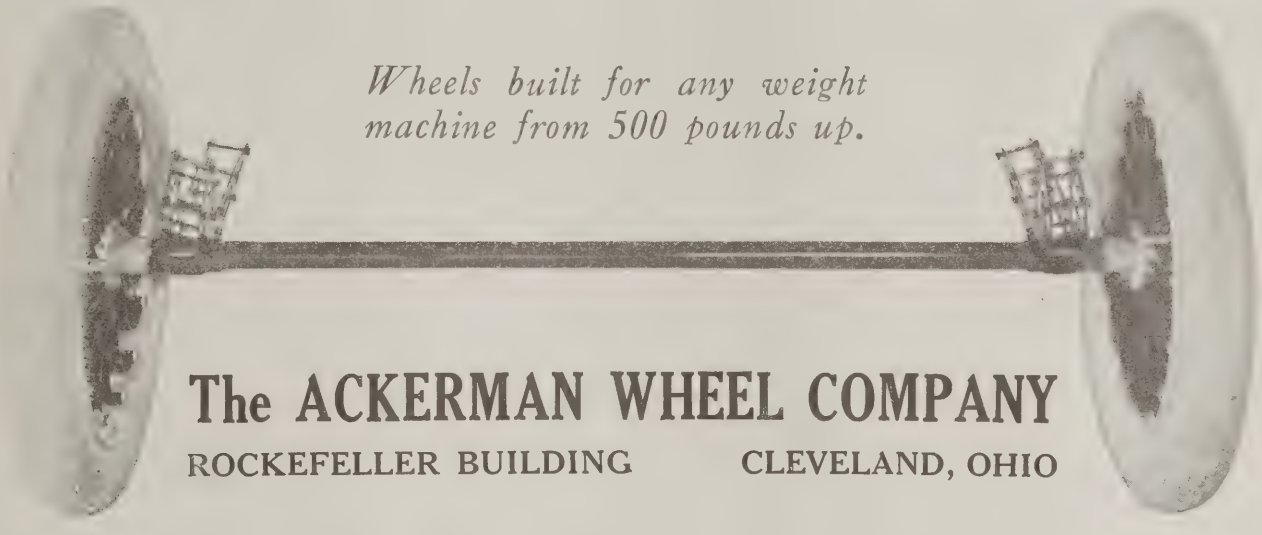
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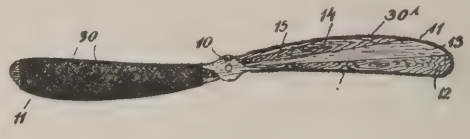
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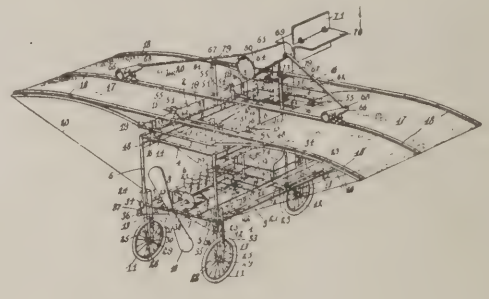
1,147,233. PROPELLER. Arthur Hugo Cecil Gibson, New York, N. Y. Filed June 4, 1910. Serial No. 564,964. (Cl. 170—158.)

1. The herein described method of making propellers which consists in cutting a plurality of strips to desired shapes, fastening said strips together in such predetermined relations that the lines joining the intersections of said strips, in any plane cutting said strips at right angles, are either one or both curved lines, and cutting away those portions of the strip which project beyond their lines of intersection.



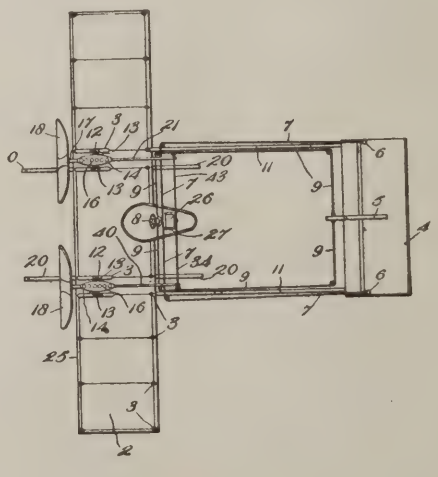
1,148,861. AEROPLANE. Theodore D. Robinson, Lockport, N. Y. Filed Dec. 26, 1911. Serial No. 667,813. (Cl. 244—29.)

1. An aeroplane having a main frame or chassis, a plane or planes, and loops connecting the inner ends of said plane or planes with said frame to allow the latter slight swinging movement and also vertical movement independent of said swinging movement.



1,148,050. STABILIZING DEVICE FOR AEROPLANES. James M. Reynolds, Butte, Mont. Filed Oct. 3, 1914. Serial No. 864,811. (Cl. 244—25.)

1. In an aeroplane having a supporting surface, the combination of a frame work associated with said surface; a plurality of engines provided with shafts pivotally mounted to move up and down parallel to each other in said frame work; a propeller mounted on each shaft; a seat for an aviator; and connections between said engines and said seat, whereby the said aviator may readily tip each propeller in opposite directions relatively to said supporting surface to aid in stabilizing the machine; substantially as described.



AERIAL AGE WEEKLY

Vol. 6, No. 9 NOVEMBER 12, 1917 10 CENTS A COPY



Curtiss JN-4 at one of the training fields "Somewhere in Europe." British official photo.

NOTICE TO READER

When you finish reading this issue, place a one-cent stamp on this notice, hand same to any postal employee, and it will be placed in the hands of our soldiers or sailors at the front.

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A. S. Burleson, Postmaster-General

American Air Fleet to be in Europe Next Summer

Hispano-Suiza

On Sept. 18th, a Wright-Martin airplane driven by a 150 hp. Hispano-Suiza motor made the American altitude record of 22,000 ft.



Wright-Martin

New Brunswick, New Jersey, U.S.A.

Aircraft Corporation

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NEW AEROPLANES READY BY JULY

THE aeroplane construction undertaken by the United States has progressed to a stage that it is possible to announce officially that there are no demands of this Government or of the Allies which the manufacturing facilities of American plants cannot supply after next July. This assertion was made with every appearance of confidence, states *The New York Sun.*

It was said that this country, as the result of the preparations now being rushed to completion, was able to assure the Allies that the number of aeroplanes they could get from American factories after the middle of next year practically would be limited by their ability to transport them.

Officials in charge of the aviation program are staking their success on the theory of quantity production. They say they have solved this problem, and that once manufacturing is well under way the output will be limited only by the appropriations granted and the facilities for transportation abroad.

In a process of cylinder manufacture worked out by Henry Ford, instead of cutting away twenty pounds of metal from each cylinder casting by the present method of boring accurately, cut steel tubing will be utilized, being cut off and shaped mechanically. Several thousand can be turned out in a day.

The first fighting aeroplane wholly made in America of American materials has taken the air in successful test flights. Officials of the Aircraft Production Board said few changes in the design of either the plane or the "Liberty motor" are believed necessary, and that production in quantity of the fighting machines soon will be in progress in many factories.

American engineers expect that the aircraft program can be made whatever the Allies require. Originally the figures were set at 50,000 motors and 22,000 planes by July.

AERO SHOW TO BE LARGER THAN LAST YEAR'S

THE success of the Aero Show is assured. The reservations for space are pouring in and the second floor having been reserved by firms making accessories and parts, space is now being allotted on the third floor of the Grand Central Palace, which was not used last year.

The Motor and Accessories Association has sanctioned the show and has taken a good lot of space for its members.

It is generally appreciated that the show will afford tremendous opportunities to bring aeroplanes, motors, accessories and machinery and equipment of different kinds to the attention of the representatives of the eighteen Allied countries and get good size orders.

Commissions of Eighteen Allied Countries Will Attend Show

The commissions of the eighteen Allied countries will attend the show—as they did last year. The show affords to these commissions, as well as to U. S. Army and Navy officials, an opportunity to see what manufacturers of aircraft, parts and accessories are doing and to talk with the representatives of firms and find out other latest information regarding possible production and developments which the manufacturers will only give confidentially to the proper officials.

Eleven Latin-American Countries Who Have Severed Relations with Germany Are Sending Commissions to Exposition

Eleven Latin-American countries who have severed relations with Germany are sending Commissions to the Exposition in anticipation of placing orders for aeronautic equipment. Three of these countries, Brazil, Cuba and Panama, have declared war on Germany. The others, Bolivia, Guatemala, Honduras, Nicaragua, Haiti, Costa Rica, Peru and Uruguay have severed relations. The Argentine Republic and Chile are considering severing relations, following the example of Brazil.

These countries are in the market for aeronautic supplies and know from their being represented at the first Aeronautic Exposition, that they can save time and efforts by sending a Commission to the Exposition. They were all advised several months ago that the Exposition will be held and they advised officially that they would appoint special commissions to attend the Exposition.

Show to Be of Great National Importance

The Second Pan-American Aeronautic Exposition promises to be one of the most important factors in carrying out President Wilson's request that every effort be made to **"educate the country to its task . . . stimulating recruiting and patriotic interest in the war to the end that the utmost co-operation of all citizens in the successful prosecution of the war be secured."**

As was the case last year, the Aero Show will follow the Automobile Show and the Motor Boat Show, which are also to be held at the Grand Central Palace in January and February. The Aero Show will be held from February 16 to 23.

AERIAL AGE recently gave twenty different points of value of the Exposition, which can be found in the announcement of the Exposition appearing elsewhere in this number.

The flood of requests for space from manufacturers of aeroplanes, aero motors, aeronautic accessories and supplies, who are not working to their full capacity, brings out another point of value of the coming Exposition. These firms know that every exhibitor in the first Pan-American Aeronautic Exposition booked a considerable amount of business and anticipate that the Second Exposition will bring a great deal more.

There will not, of course, be exhibited any new military developments which may be of value to the enemy. But, whereas there are about thirty thousand families that have sons in the air service, the members of which have never seen an aeroplane; and there are millions of Americans who have never seen an aeroplane, to whom the sight of the average aeroplane will be a matter of great educational value, the lack of new developments will not lessen the public interest in the Exposition.

Already great interest is shown in the Exposition by inventors and engineers who have been attracted to the aeronautic government by the fact that there are so many problems to be solved and possible engineering developments. They

are anxious to get a concrete idea of the fundamentals of aeronautic engineering and to see aeroplanes, motors and aeronautic devices at close range. Congress is expected to appropriate at least $1,000,000,000 for aeronautics in its coming session, and the Army and Navy Air Services will be greatly increased in size, there will be need for a large number of trained engineers, and there will be important work for trained inventors. Therefore, the Exposition will be beneficial in one more way, through giving opportunity to hundreds of engineers to familiarize themselves with the development of aeronautics.

Aeronautic Congress to Be Held

An important Aeronautic Congress is to be held, with daily meetings which will be addressed by leading authorities, as was the case last year. There will also be shown a collection of special aeronautic films.

New York Herald's Comment

WHILE the first Pan-American Aeronautic Exposition held in Grand Central Palace last February, under the auspices of the Aero Club of America, was a most successful exposition financially, patriotically and otherwise, it will scarcely compare with the exposition of aircraft and parts which the same organization will promote in the same building next February 16 to 23.

The first show came before the United States was drawn into the war—at a time when the public scarcely realized that such a thing as America entering the war could be possible or probable. Now the American public views the aircraft manufacturing problem from an entirely different angle, for obviously the aeroplane and dirigible balloon—the eyes of the artillery—are to be potently decisive factors in winning the war for democracy.

Following the Automobile Show closely, the aeronautic exposition is receiving the support of the automobile and motor accessories industries, for these two important industries practically dovetail with the interests manufacturing aircraft. Automobile factories are now turning out new motors to be mounted in aeroplanes; tire companies are furnishing the material for balloons and aeroplane wings; numerous accessory factories are turning out ignition, carburetion and self-starting mechanisms for the fighters of the air.

Prior to the war there was an aeronautic show in Paris each year for a number of years. These ceased when the war broke out, for Paris was too close to the western front. In Italy, however, an aircraft exposition was held recently in Turin, under the auspices of the Italian government, and was successful. There is much in the way of aeroplanes and balloons and their parts which can be shown at a public exposition without any danger of the enemy receiving information of benefit to them which might be obtainable through spies.

All of the foreign motors manufactured under license in this country have been used on the battle front for a long time, and aeroplanes equipped with them have been shot down and have fallen into the enemy's hands, so that engineering features of the Allies' machines are largely known by the Germans, and vice versa, for the Allies have brought down every type of German and Austrian machine. Some of the engines of these have been in this country for some time.

Last year's display of aircraft parts, while sufficiently large to occupy an entire floor at the Palace, was small compared with the array that will be seen at the forthcoming exposition. The government's appropriation of $640,000,000 was the means of many embryo concerns securing financial backing to go ahead with the manufacture of aircraft parts. One thing which assures an enormous attendance this season is that not only the general public is interested in aeroplanes from a patriotic standpoint, but thousands of youths in our schools and colleges are making determined efforts to enlist in the Aviation Section, Signal Corps, or entering the navy as fliers. These young Americans will attend and bring their friends, and the success of the exposition far beyond last year is positively assured.

LORD NORTHCLIFFE PRESENTS ALBERT MEDAL TO ORVILLE WRIGHT

AS reported briefly in last week's AERIAL AGE, Orville Wright, inventor of the aeroplane, has been presented with the medal of the Royal Society of Arts of England. The audience which assembled in Memorial Hall, Dayton, on this occasion was a memorable one, including the following prominent personalities: Lord Northcliffe, Orville Wright, Miss Katharine Wright, Alan R. Hawley, president of the Aero Club of America; Howard E. Coffin, chairman, Aircraft Production Board, and member Board of Governors, Aero Club of America; Colonel E. A. Deeds, member Aircraft Production Board; Colonel Harry E. Talbott, Colonel H. G. Price of the British Embassy, Lieut. Col. George M. Bomford, commanding officer Wilbur Wright Field; Captain C. W. C. Wheatley, Royal Flying Corps; Charles Jerome Edwards, member Board of Governors, Aero Club of America; Colonel Campbell Stuart, Commander Jenkins, British Admiralty; H. E. Talbott, Jr., president of the Dayton-Wright Company; Henry M. Waite, Miss Winifred Ryder, C. F. Kettering, Hamilton Fyfe, Frank S. Lahm, ex-Governor J. F. Campbell, Dr. W. O. Thompson, president of Ohio State University; Dr. Clark W. Chamberlain, president of Denison University, professor of physics and inventor of the compound interfermometer, which makes measurements to one-millionth of an inch; Dr. W. C. Sabini, Harvard University, professor of physics and well known to the scientific world; Peter Cooper Hewitt, known throughout the world for his inventions and scientific applications; James W. Faulkner, widely known newspaper man; John T. McCutcheon, cartoonist for the *Chicago Tribune;* E. R. Cordley, Dr. L. H. Baekeland and Charles R. Flint.

Presentation Made at Memorial Hall

The presentation was made at Memorial Hall. The meeting opened promptly at 4 o'clock in the afternoon.

When the persons who were to occupy the stage marched in, headed by Lord Northcliffe and Orville Wright, the audience rose and cheered wildly.

The meeting coming to order, City Manager Henry M. Waite made a short address, in which he referred to the purpose for which the meeting was called. He said:

"We, the citizens of Dayton, assembled by this unique opportunity, are given the occasion to express our pride in one of our most respected citizens.

"In an age when self-advertisement has been pushed to the limit, Mr. Wright has endeared himself to the hearts of Dayton and the world by virtue of his modesty no less than his genius.

"Today Dayton welcomes a man known to the world as an interpreter of ideas and events.

"He represents one of the oldest and most distinguished societies in England. The Royal Society of Arts presents to one of our citizens its appreciation of Mr. Orville Wright's scientific achievements.

"This is an honor appreciated by his fellow citizens of Dayton and the State of Ohio.

"It is therefore appropriate that we, the citizens of Dayton, through the Governor of Ohio, present the donor to this audience."

Governor Cox spoke of the work that the Wright brothers have done for the world in inventing the flying machine. "The world has long debated the question who first evolved the principle of aviation. Standing out in the skies, to be read by every fair-minded man, is this well-known fact: The first to fly were Orville Wright and his brother Wilbur. Those who may attempt to subtract from their accomplishment, probably confine their flights to the basement of their research bureau. And we present as exhibit today one of the first children of the Wright genius, suspended now in this presence," said Governor Cox, pointing to the exact duplicate of the first successful Wright aeroplane that was suspended from the ceiling.

In presenting Lord Northcliffe, Governor Cox said: "It gives me great pleasure to present to you Lord Northcliffe, the man about whom our hopes are centered in the winning of the great war in behalf of civilization."

Lord Northcliffe, who was greeted with prolonged applause, addressed the Governor and proposed a silent toast to the memory of Wilbur Wright.

Medal Presented

Orville Wright stepped forward, and amid prolonged ovations, received from Lord Northcliffe the medal of the Royal Society of Arts of England.



THE NEWS OF THE WEEK



Yale Is Expecting Aviation School

New Haven.—Yale men are looking forward with keen anticipation to the time when, according to the popular belief in this locality, men of the undergraduate body will be seen flitting through the air or skimming the nearby waters of Long Island Sound. When the proposed school of aviation, which it is expected will be established at the university within a reasonably short time, is in service, Yale will have about everything along military and naval lines that there is.

New Haven furnishes an ideal location for the establishment of a school of aviation. For the men who are to fly on land Yale Field, in the vicinity of the Yale Bowl, furnishes a splendid landing point, with plenty of room for manoeuvring to climb into or descend from the air. For the "water dogs" there is the Sound, with its nearby beaches, a number of which offer excellent landing and starting points as well as room for the construction of such hangars as might be needed.

The original plan for the school was to confine the work of the men entirely to "ground" instruction, that is, to the principles of air fighting,—what to do with a machine under given conditions and how to care for it. All of this, it is assumed, will be done by the airmen of the university, but, according to reports that have just been received by those who are behind the movement at Yale, the course will go considerably further.

Liberty Planes a Success

A despatch in the New York *Times* states that the first tests of the "Liberty Aeroplanes" have been successful. Official announcement is withheld, but it is known that the tests are regarded by experts as eminently satisfactory.

The plane is a modification of a standard French type, but was built in this country. It is a two-seater, having facilities for the machine gunner directly in front of the fuselage cockpit, in which the operator is installed.

During the two-hour flight which was included in the test, the aviator had no difficulty in accomplishing all the difficult stunts which have become the daily exercise of the allied fliers.

Fly 1,023 Miles in 10 Hours

Lexington, Ky.—The longest flight ever made by an aeroplane in the Middle West is that reported here from Paducah, Ky.

Lieut. Hanson McCann, of the United States naval forces at Newport News, Va., carried a seaman, Charles Allen, from Newport News to Duquoin, Ill., a total distance of 1,023 miles, in a little less than ten hours. Only one stop was made, that being for gasoline.

The flight was made on an errand of mercy. Allen was at his duties when a message was received that his mother was dying in Illinois. He could not get a train at once and asked his superiors for help. Lieut. McCann was appointed to fly to Duquoin with Allen. The start was made at 5:30 o'clock in the afternoon, and the flight was made without trouble.

Lane Will Fly for U. S. Navy

Washington.—Lieut. Franklin K. Lane, Jr., son of the Secretary of the Interior, one of the first to qualify for a commission in the aviation section of the Signal Corps of the Army, has resigned and accepted a commission as a Navy flier. He will have the same rank in the Navy as he held in the Army.

Lieut. Lane is one of the youngest commissioned officers in the American service, being only nineteen years old. He was one of the first to succeed in the difficult tests and training given prospective military aviators and is already a full fledged flier. He was among those who made the trip from Newport News to Washington in the Italian Caproni triplane.

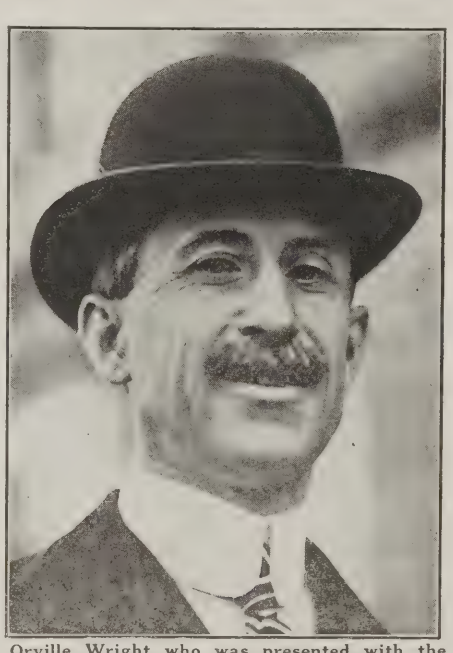
No reason was given to-day for young Lane's shift except a preference for the naval branch of the air service.

The M. A. A. Elects Members

At a recent meeting of the Manufacturers' Aircraft Association, held in Washington, D. C., the following qualified as members: The Dayton Wright Aircraft Corporation, of Dayton, Ohio; The Fisher Body Company, Detroit, Mich., and The Glen L. Martin Company, Los Angeles, Cal.

Throng at Wendell's Bier

Funeral services for the late Evart Jansen Wendell, philanthropist, who died at Neuilly, France, on August 25, were held recently at the Calvary Episcopal Church, Fourth Avenue and Twenty-first Street, by the Rev. Theodore Sedgwick, assisted by the Rev. Dr. Osborne and the Rev. Dr. Hill. The church was thronged with friends of Mr. Wendell, and delegations were present from every club, society or organization of which he had been a member. Police Commissioner Arthur Woods represented the city and Mayor Mitchel. J. P. Morgan also attended the services.



Orville Wright who was presented with the medal of the Royal Arts Society of Great Britain for his distinguished work in aeronautics

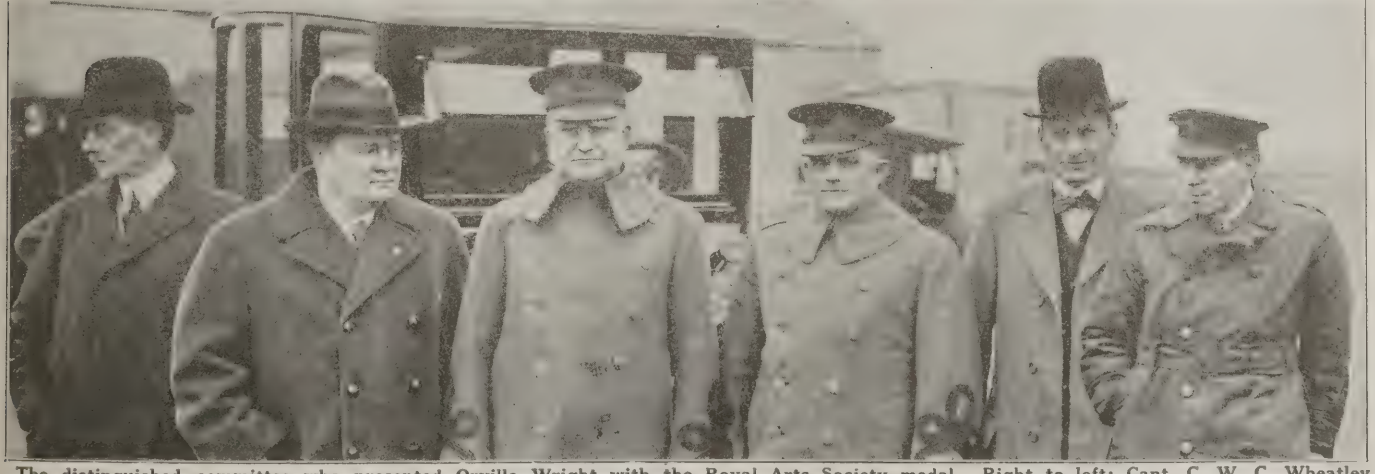
The pallbearers were William Church Osborn, William B. Osgood Field, E. Hamilton Bell, Alan R. Hawley, Francis R. Appleton, Wendell Baker, Anson P. Stokes, T. Tileston Wells, Henry W. Hayden, Robert N. Brace, President A. Lawrence Lowell of Harvard University, and Charles D. Dickey. The ushers were Langlon P. Marvin, Thomas W. Slocum, Lawrence E. Sexton, George Blagden, Benjamin T. Tilton, Thomas W. Lamont, Gordon Knox Bell, Nicholas Biddle, Jerome D. Greene, Francis H. Kinnicutt, J. Edward Weld, Edwin G. Merrill, Frederick L. Eldridge and James J. Higginson.

The following clubs and societies of which Mr. Wendell had been a member or with which he had been affiliated were represented: The Aero Club, by Alan R. Hawley, Rear Admiral Fiske, Henry Woodhouse, Roy U. Conger, Arthur Johns, Wm. Hawley, Amateur Comedy Club, A. S. P. C. A., Amateur Athletic Union, Boy Scouts of America, Boys' Club, Children's Aid Society, Five Points House of Industry, Harvard Club by 200 members, Half Orphan Asylum, House of Refuge, Holland Society, Intercollegiate Athletic Association, Lambs Club, New York Historical Society, New York Genealogical and Biographical Society, New York Athletic Club, Newsboys' Lodging House, The Players' by fifty members, the Public School Athletic League, the Parks and Playgrounds Association, the Quill Club, the St. Nicholas Society, St. Mark's Hospital, the Thursday Evening Club, the University and Yale clubs.

Interment was at Woodlawn.

Large Caproni Carries Canadian Officer Over New York City

On November 3 the large Italian Caproni biplane left Mineola at 3.40 p. m., carrying the pilot, Lieut. Resnati, and three passengers with Red Cross postcards. The dual control seat was occupied by Lieut. H. A. Farr, of the Royal Flying Corps, who piloted the machine part of the distance, relieving Lieut. Resnati, climbed to an altitude of 3,000 feet and headed straight for New York. Heavy mist hung over the city and surrounding country. Reaching New York about 4.10 p.m., they dropped to an altitude of about 700 feet, approaching the city from the Battery after skirting Governors Island. All three motors were throttled down and the big machine handled beautifully, although it was blowing a gale over the heart of New York. It skirted the Woolworth Building, where a large number of people had collected in the tower to view the flight. The pilot could easily recognize the faces of the people standing there. After circling all the big downtown buildings and then headed straight up Broadway to Central Park, where a left hand bank was made and the big machine was headed downtown again. The wind was very puffy and Lieut. Resnati was continually working the controls. One of the motors gave trouble over the downtown district; but the big Caproni had ample power to combat the gale which was blowing. The Red Cross cards were finally all dropped and the giant craft headed back to Mineola. It was even more misty on the return trip and Lieut. Resnati decided to head the big Caproni to a higher altitude until somewhere in the vicinity of Mineola. After reaching an altitude of 7,000 feet the cold was intense and Lieut. Resnati decided to remain at this altitude until he reached Mineola, and at 4.45 p. m. the big Caproni was put into a spiral right over the Mineola field, dropping from 7,000 feet to 1,000 feet, when the machine was straightened out and a beautiful landing was made.



The distinguished committee who presented Orville Wright with the Royal Arts Society medal. Right to left: Capt. C. W. C. Wheatley of the Royal Flying Corps., Howard E. Coffin, Lieut.-Col. George M. Bomford, Colonel E. A. Deeds, Lord Northcliffe and Colonel Harry E. Talbot

Canada Checks Officers

Montreal.—Canadian officers are forbidden hereafter to offer their services to the American Government for instructional or other purposes, either directly or through the British Embassy at Washington.

There has been such an abundance of officers in Canada that they could not all be used, and it transpired that a number of them have endeavored to offer their services to the United States Government. This has led to communications from Washington to headquarters at Ottawa. These were followed by prompt action at Ottawa, with instructions that hereafter any officers desiring to offer their services should do so through the Canadian Government.

National Automobile Chamber of Commerce Offers Co-operation

Washington.—The War Industries Board conferred November 2d with automobile and accessories manufacturers, who pledge their full co-operation to the Government in whatever is necessary to win the war.

The plan is to divert a part of each plant to the production of war material. It was made plain to the manufacturers that while their help is required, the Government has no intention of taking any action which would cripple the industry. It was arranged to have the manufacturers represented on the National Automobile Chamber of Commerce and the motor and accessories manufacturers appoint a committee to work with the automotive products section of the War Industries Board in planning how the big automobile factories of the country can be of the greatest service.

Among those who attended the conference were Col. Charles Clifton, president of the National Association of Automobile Manufacturers; Howard E. Coffin, of the Advisory Commission of the Council of National Defense; Gen. C. B. Baker, Quartermaster's Corps, U. S. A.; C. W. Stiger, president of the Motor and Accessories Manufacturers; H. F. Russell, president of the Manufacturers' Aircraft Association; H. R. Sutphen, representing the National Association of Engine and Boat Manufacturers; T. W. Henderson, president of the Motorcycle Manufacturers and Allied Trades Association; Coker F. Clarknin, general manager of the Society of Automotive Engineers and a member of the Automotive Products Sections of the War Industries Board, and Hugh Frayne, of the War Industries Board.

Wardrop Addresses Metropolitan Section S. A. E.

At the last meeting of the Metropolitan Section of the Society of Automotive Engineers, held at the Automobile Club of America, Mr. G. Douglas Wardrop, editor of AERIAL AGE, delivered a lecture which covered every phase of the war in the air. He showed for the first time motion pictures of the huge Handley-Page bombing machines, which proved to be of immense interest to the large audience of engineers present. The engineers hailed the lecture as the most complete presentation of the subject they had ever had.

On November 2d Mr. Wardrop delivered his lecture before the University Club of Bridgeport, when a large body of army and navy officers were in attendance.

Hydroaeroplane Sets Speed Record of 125 Miles an Hour

Lieutenant Giuseppe Adamoli, of the Italian Aero Corps, set a new record for long distance speed flying when he traveled from Norfolk, Va., to Mineola, L. I., a distance of 300 miles, to two hours and twenty-five minutes. He maintained a speed of more than 125 miles an hour. Adamoli used a one-man hydroaeroplane for the flight. He left Norfolk at 10.30 o'clock in the morning and reached Mineola at 12.55 o'clock in the afternoon. Adamoli's hydroaeroplane carries two machine guns, so adjusted that they can be fired while the craft is traveling at high speed.



Lieut. Commander A. C. Read and the Aeromarine seaplane he pilots at the Naval Reserve Training Station, Bayshore, L. I.

"The trip was wonderful," said Adamoli at the Ritz-Carlton Hotel. "It was an ideal day for speed. There was little wind resistance, but the cold was intense. After leaving Norfolk I steered a straight course up the Atlantic. I passed over Cape Charles and headed toward Delaware Bay.

"My machine worked perfectly. At times I climbed to 7,000 feet, and I traveled at the rate of almost 150 miles an hour."

Two weeks ago Baldioli, in a Pomilio, with one passenger, covered the same distance in three hours.

Japanese Fiscal Agents to Put Standard Aircraft Corporation Stock on the Market

Mitsui & Co., Ltd., the Japanese fiscal agents who own the controlling interest in the Standard Aircraft Corporation, are going to put the stock of that organization on the market.

Harry Bowers Mingle, who is the general counsel of Mitsui & Co., Ltd., having served in that capacity for a number of years, has arranged for the re-incorporation of the company, and employed publicity agents to handle the publicity.

The announcement issued by these publicity agents is as follows:

New York, Nov. 1—The Standard Aircraft Corporation, with factories in Plainfield and Elizabeth, N. J., was incorporated yesterday in Albany for $5,000,000, divided into $2,000,000 preferred and $3,000,000 common stock. Harry Bowers Mingle is president of the new corporation and the Board of Directores is composed of Charles H. Day, C. Vernon Bradford, Daniel L. Meenan, Jr., C. G. Stratt and Mr. Mingle.

"It was announced that the new concern now has millions of dollars' worth of Government orders and expects to employ more than 8,000 men and women in the main plants. The new plant at Elizabeth, N. J., covers 87 acres, and the main buildings have more than 300,000 square feet floor space. There is also a 60-acre flying field and 5 acres of waterfront on which will be established the hydroaeroplane hangars and test sheds. This plant represents an investment of more than $1,000,000. In addition to the two main plants, the Standard Aircraft Corporation has seven smaller factories in which parts of aeroplanes are made. It is expected that 60 aeroplanes a week will be the normal output of the new corporation."

Nothing was given for publicity regarding the status of the suit against the Japanese owners of the Standard Aero Corporation brought by Mr. John E. Sloane. The details of the suit printed in the New York *Times* several months ago are as follows:

"A suit of John Eyre Sloane, an inventor of aeroplanes, who married Miss Madeline Edison, daughter of Thomas A. Edison, against the Mitsui Company, a Japanese commission firm, for an injunction and an accounting, was revealed in the Supreme Court yesterday, when Konosuke Seko, of 150 West Seventy-ninth Street, general manager of the Mitsui Company, was examined in Sloane's behalf.

"Sloane also names as defendants the Sloane Manufacturing Company and Shunzo Takaki, assistant manager of the Mitsui Company. The Sloane Company is a New Jersey corporation which manufactures aeroplanes at Plainfield and has 50,000 shares of stock valued at $10 each. Sloane held 26,500 shares of the stock. He alleges that he agreed to borrow $30,000 from the Mitsui Company through Takaki to finance the manufacture of aeroplanes for the Russian Government, giving his stock as security, and that it was agreed his shares were to be returned as soon as the loan from the Mitsui Company had been repaid from the profits. Without his authority, and in violation of the agreement, he also alleges Takaki in May, 1916, transferred his stock to the Standard Aero Corporation in which the defendants are interested.

"Sloane charges that after the majority stock in the company had been transferred the defendants 'stripped the Sloane manufacturing Company of its asset and highly profitable business,' and the Standard Aero Company took over the business. He wants the defendants enjoined from carrying out their purposes and demands that they account.

"Seko, manager of the Mitsui Company, examined by Milton Mayer for the plaintiff, testified that his company had some dealings with Thomas A. Edison, as the result of which the loan to Mr. Edison's son-in-law was made. Sloane found himself unable to get the financial aid he expected from his relatives, Seko said, and finally adjusted the matter by turning over the stock in payment."

American Flyer Serving in Serbia Cited for Bravery

Paris.—Sergeant Paul Pavelka, of Madison, Conn., formerly a member of the Lafayette squadron and now flying with the French in Serbia, has been commended in army orders. His citation says that he "has always shown great activity, giving repeated proofs of devotion to duty, and has fought numerous air duels, frequently returning to his base with his machine riddled by bullets."



A German seaplane about to start on North Sea reconnaissance

Champion Killed in Japan

Kobe, Japan.—Frank Champion, the American aviator, was killed by a fall from a height of 4,000 feet November 1 at Kochi. In the morning he had made a successful flight in the presence of 100,000 spectators on the Askura military parade ground and received a tremendous ovation on alighting.

In the afternoon, after flying over Kochi he began a series of manoeuvres. In making a turn the left wing of his plane gave way and fell like a leaf. The machine plunged into a shallow marsh, the broken wing coming to the ground soon after.

Lieut. Van Alstyne of Boston Returns From Front

Lieut. J. W. Van Alstyne of Boston, member of the Royal Flying Corps, has returned from the Western front on sick leave.

Lieut. Van Alstyne has been in a hospital in England for eleven months, recovering from severe wounds suffered during an encounted with a German flying squadron at an altitude of 10,000 feet. He was first winged over the German lines and began to plane toward his own. One knee was shattered and his neck gashed by shrapnel.

Two members of the squadron with which he was flying were killed, but Van Alstyne and the others got back to the British lines.

NAVAL and MILITARY AERONAUTICS

Only Seven Accidents in Training United States Air Pilots Since War Began

The Committee on public information has issued the following:

There have been to date, in six and a half months since the beginning of the war, a total of seven accidents, resulting in eight fatalities in connection with the whole training program for America's air army. Of these fatalities, two were caused by men on the ground being struck by the propeller of a machine. The Aviation Section has been gratified that the fatalities have not been more numerous, especially in view of the hundreds of absolutely new and inexperienced pilots who have been taking the air.

In the selection of aviators special attention is given to responsibility of character and to general athletic suppleness. The system of training is designed to prevent the occurrence of accidents through inexperience or carelessness. Eight weeks are spent in the preliminary ground training in the theories of flight. Before the men take the air at all they are given careful instruction in running machines along the ground to accustom them to the various controls. Their early flights are made under close supervision with an instructor; and later, when they first fly alone, they are under strict rules for safety.



The wing construction of the huge Handley-Page bombing machines

Promotions in the Aviation Section of the Signal Corps

Promotions in the Aviation Section, Signal Corps, are announced as follows: all to date as of October 23, 1917;

To be Colonel in Aviation Section, Signal Corps—Lieut. Col. Brice P. Disque.

To be lieutenant colonels in Aviation Section, Signal Corps—Hiram Bingham, Thurman H. Bane, John F. Curry, Edgar S. Gorrell, L. E. Goodier, Henry W. Harms, H. B. Hersey, B. Q. Jones, W. G. Kilner, William L. Patterson, and David L. Roscoe.

To be majors in Aviation Section, Signal Corps—Oscar A. Brindley, Maurice Connolly, A. C. Downey, John P. Edgerly, D. M. Henry, A. B. Lambert, W. C. Ocker, A. D. Smith, and R. D. Smith.

To be captains in Aviation Section, Signal Corps—William A. Campbell, C. W. Connell, E. A. Coleman, Foster Crampton, Carroll Dunham, 3d.; E. P. Hinds, Stephen J. Idozorek, F. N. Igelhart, E. L. Jones, Samuel Kataman, W. W. Lanaham, H. T. Lewis, H. Minott, Charles J. Nourse, J. H. Packard, 3rd.; D. H. Payne, Lawrence C. Ricker, H. H. Salmon, W. F. Voldant, J. C. Tips, L. F Whitney, D. R. Wheeler, W. P. Willets, and Clarence P. Young.

Given Aviation Command

Lieut. Col. Virginius E. Clark, Signal Corps, United States Army, is relieved from duty in the office of the Chief Signal Officer and will proceed to McCook Field, Dayton, Ohio, and assume command of the Signal Corps aviation station thereat.

Maj. Clinton W. Russell, junior military aviator, Signal Corps, is relieved from duty at Kelly Field, South San Antonio, Tex., and will proceed to Rich Field, Waco, Tex., and report on November 10, 1917, to the commanding officer for assignment to duty.

Maj. George W. Krapf, junior military aviator, Signal Corps, is relieved from duty at Hazelhurst Field, Mineola, Long Island, N. Y., and will proceed to Call Field, Wichita Falls, Tex., and report on November 10, 1917, to the commanding officer for assignment to duty.

Maj. Arnold N. Krogstad, junior military aviator, Signal Corps, is relieved from duty at Selfridge Field, Mount Clemens, Mich., and will proceed to Rich Field, Waco, Tex., and report on November 10, 1917, to the commanding officer for assignment to duty.

Capt. William C. Ocker, Aviation Section, Signal Officers' Reserve Corps, is relieved from duty at Chandler Field, Essington, Pa., and will proceed to Gerstner Field, Lake Charles, La., and report on November 10, 1917, to the commanding officer for assignment to duty.

First Lieut. Frank F. Bell, Aviation Section, Signal Officers' Reserve Corps, is relieved from duty at Chandler Field, Essington, Pa., and will proceed to Gerstner Field, Lake Charles La., and report on November 10, 1917, to the commanding officer for assignment to duty.

First Lieut. William F. Volandt, Aviation Section, Signal Officers' Reserve Corps, is relieved from duty at Chandler Field, Essington, Pa., and will proceed to Gerstner Field, Lake Charles, La., and report on November 10, 1917, to the commanding officer for assignment to duty.

Lieut. Col. Lewis E. Goodier, Jr., Signal Corps, is relieved from duty at Chandler Field, Essington, Pa., and will proceed to Gerstner Field, La., at the proper time and report on November 10, 1917, to the commanding officer for assignment to duty.

Capt. Henry H. Sands, Aviation Section, Signal Officers' Reserve Corps, will proceed to this city and report to the Chief Signal Officer of the Army for duty.

Extracts from Special Order 250.

First Lieut. John F. McPherson, Signal Corps, to aviation concentration camp, Garden City, Long Island, N. Y., for duty.

The following named Lieuts. Signal Corps, to aviation concentration camp, Garden City, Long Island, N. Y.: James O. Porter, Dwight M. Bartlett, Charles J. Boland, J. Carlisle Bollenbacher, Bache H. Brown, George A. Cahill, Guy S. Deming, Luther H. Johnson and Raphael C. Pitcher.

First Lieut. George F. Hughes, Av. Sec., S. O. R. C., on duty in aerial flights from August 11, 1917.

Major William L. Moose, Jr., Signal Corps, to Chief Signal Officer of the Army for assignment to duty.

First Lieut. Edward B. Ashley, Jr., Signal Corps, to Chief Signal Officer of the Army, for duty.

Capt. Carl G. Thebein, Signal Corps, aviation concentration camp, Morrison, Va.

Lieut. Col. Lewis E. Goodier, Jr., Signal Corps, from duty at Chandler Field, Essington, Pa., to Garstner Field, Lake Charles, La.

Major Clinton W. Russell, Junior Military Aviator, Signal Corps, from duty Kelly Field, South San Antonio, Texas, to Rich Field, Waco, Texas.

Major George W. Krapf, junior military aviator, Signal Corps, from duty Hazelhurst Field, Mineola, Long Island, N. Y., to Call Field, Wichita Falls, Texas.

Major Arnold N. Krogstad, junior military aviator, Signal Corps, from Selfridge Field, Mount Clemens, Mich., to Rich Field, Waco, Texas.

Capt. William C. Ocker, Av. Sec., S. O. R. C., from duty at Chandler Field, Essington, Pa., to Gerstner Field, Lake Charles, La.

First Lieut. Frank F. Bell, Av. Sec., S. O. R. C., from Chandler Field, Essington, Pa., to Gerstner Field, Lake Charles, La.

First Lieut. William F. Volandt, Av. Sec., S. O. R. C., from duty at Chandler Field, Essington, Pa., to Gerstner Field, Lake Charles, La.

First Lieut. John Pollock, Av. Sec., S. O. R. C., from duty Taliaferro Field, Fort Worth, Texas to Call Field, Wichita Falls, Texas.

First Lieut. Harry S. Alexander, Av. Sec., S. O. R. C., from duty Hazelhurst Field, Mineola, Long Island, N. Y., to Rich Field, Waco, Texas.

First Lieut. Howard P. Culver, Av. Sec., S. O. R. C., on duty in aerial flights from July 25th, 1917.

First Lieut. Frank C. Osburn, Av. Sec., S. O. R. C., to Selfridge Field, Mount Clemens, Michigan.

Capt. Rodman Gilder, Av. Sec., S. O. R. C., to the Chief Signal Officer of the Army, for duty.

Extracts from Special Order 249.

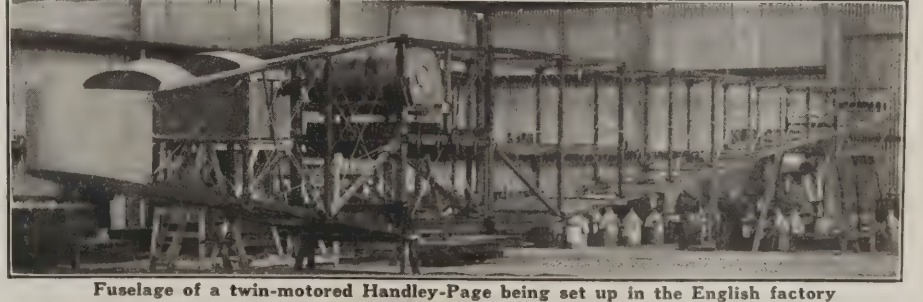
First Lieut. Norman M. Hulings, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, New York, and report to the commanding general, Signal Corps concentration depot, that place, for duty.

The following named officers of the Signal Officers' Reserve Corps are assigned to active duty and will proceed to Little Silver, New Jersey, and report in person to the commanding officer, Camp Alfred, Va., for duty: First Lieuts. Edward N. Jackson, Howard Kingsmore.

The assignment by the Surgeon General of the Army of Contract Surg. Robert C. Lynch, United States Army, to duty at New Orleans, La., October 17, 1917, with the Aviation Section, Signal Corps, and directing him to report in person to the officer in charge, physical examining unit, that place, is confirmed and approved.

First Lieut. William F. Jones, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. Murray Earle, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will proceed to Essington, Pa.,



Fuselage of a twin-motored Handley-Page being set up in the English factory

and report to the commanding officer, Chandler Field, for duty.

First Lieut. Joseph B. White, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will report in person to the commanding officer, School of Military Aeronautics, Cornell University, Ithaca, New York, for assignment to duty.

Major John B. Brooks, Signal Corps, upon arrival in the United States, will proceed to Call Field, Wichita Falls, Texas, in time to arrive there by November 10, 1917, and assume command of the Signal Corps Aviation School at that place.

First Lieut. Lawrence J. Willinger, Av. Sec., S. O. R. C., to duty at Selfridge Field, Mount Clemens, Michigan.

First Lieut. Thomas C. Sims, Av. Sec., S. O. R. C., to concentration depot, Garden City, Long Island, New York.

First Lieut. Geroid Robinson, Av. Sec., S. O. R. C., to Chief Signal Officer of the Army for assignment to duty.

First Lieut. Lloyd G. Schultz, Av. Sec., S. O. R. C., to Camp Kelly, South San Antonio, Texas.

Second Lieut. H. A. Gulley, Infantry Officers' Reserve Corps, to report to commanding officer Signal Corps detachment, School for Aerial Gunnery, Toronto, Canada.

Second Lieut. M. B. Rotholz, Infantry, National Army, to report to the commanding officer, Signal Corps detachment, School of Aerial Gunnery, Toronto, Canada.

First Lieut. Thomas J. Quinlan, Av. Sec., S. O. R. C., to aviation concentration camp, Garden City, Long Island, New York.

First Lieut. Henry H. Nutt, Av. Sec., S. O. R. C., aviation concentration camp, Garden City, Long Island, New York.

First. Lieut. Roy R. Showalter, Av. Sec., S. O. R. C., on duty in aerial flights from October 8th, 1917.

First Lieuts. Sherman H. Martin, and Arthur J. Sutton, S. O. R. C., to Langley Field, Hampton, Virginia.

Capt. Henry H. Sands, Av. Sec., S. O. R. C., to Chief Signal Officer of the Army for assignment.

First Lieut. Theophilus S. Painter, Signal Corps, to school of Military Aeronautics, Austin, Texas.

Capt. Henry B. Joy, to Chief Signal Officer of the Army for assignment to duty.

Capt. James E. Stewart, Av. Sec., S. O. R. C., to concentration depot, Garden City, Long Island, New York, for duty.

Extract Special Order 247.

First Lt. William J. M. Hutchins, S. O. R. C., to report to Chief Signal Officer of the Army for assignment.

First Lt. G. Raymond Richman, Av. Sec., S. R. C., to active duty at Essington, Pa.

The following named officers, Av. Sec., S. O. R. C., assigned to duty at Mineola, Long Island, N. Y., reporting to commanding officer, concentration depot: First Lieutenants Leslie J. Rummell, Charles B. Sands, W. Kemble Yarrow, Edwin V. Dougherty.

First Lieuts. Norman M. Hulings and John D. Sullivan, Av. Sec., S. R. C., to concentration camp at Garden City, Long Island, N. Y., for duty.

First Lieuts. Arthur J. Teller and William L. Nolan, S. O. R. C., to duty at training camp at Fort Leavenworth, Kan.

First Lt. John W. Lee, S. O. R. C., to duty at training camp at Presidio of Monterey, Cal.

First Lt. Joseph E. McElroy, S. O. R. C., to duty at Camp Alfred Vail, Little Silver, N. J.

First Lt. George S. Swanson, Av. Sec., S. R. C., to active duty at Selfridge Field, Mount Clemens, Mich.

First Lt. Chester E. Wright, Av. Sec., S. R. C., to duty at concentration depot, Garden City, Long Island, N. Y.

First Lt. Harry De M. Galiher, Sig. Corps, to Wilbur Wright Field, Fairfield, Ohio.

Capt. George L. Van Deusen, Sig. Corps, to duty as battalion commander of the 105th Field Signal Battalion at Camp Sevier, Greenville, S. C.

First Lieuts. G. Harrison Frazier, Jr., and G. Kenneth Fry, Av. Sec., S. R. C., to duty at Chandler Field, Essington, Pa.

Maj. Chester J. Goodier, Sig. Corps, to commanding officer Aviation School, Gerstner Field, Lake Charles, La.

Capt. Schuyler Schieffelin, Sig. Corps, to Kelly Field, San Antonio, Tex.

Capt. Albert B. Lambert, Sig. Corps, to command of Missouri Aeronautical winter camp at San Antonio, Tex.

First Lt. Nathan F. Hazen, S. O. R. C., is honorably discharged from the service of the United States, by order of the President, his services being no longer required.

Capt. Charles E. Heston, S. O. R. C., to report to Chief Signal Officer of the Army for assignment.

First. Lt. Wilfred G. Threader, Av. Sec., S. R. C., on duty requiring participation in aerial flights, as from Oct. 16, 1917.

First Lt. William R. Everett, Av. Sec., S. O. R. C., to duty at Taliaferro Field, Fort Worth, Tex

First Lt. Ernest L. Jones, Av. Sec., S. O. R. C., to duty at concentration depot, Garden City, Long Island, N. Y.

Capt. Joseph J. Hittinger, Q. M. R. C., to Chief Signal Officer of the Army, duty as acting quartermaster, in addition to present duties.

First Lt. James H. Adoue, Av. Sec., S. O. R. C., to duty at concentration depot, Garden City, Long Island, N. Y.

First Lt. Frederick M. Murphy, Av. Sec., S. R. C., to duty at Missouri Aeronautical Society winter camp at San Antonio, Tex.

First Lt. Stafford G. de Lesdernier, Av. Sec., S. R. C., to Chief Signal Officer of the Army for assignment.



Portable searchlight signalling outfit used by members of the French Aviation Corps.

Special Orders No. 248

The following-named officers, now on duty in connection with aviation, are assigned to duty with the Aviation Section, Signal Corps, at their present station and will report by letter to the commanding general, Aviation Section, Signal Corps, United States Army, Washington, D. C.

Medical Corps

Maj. Benjamin B. Warriner, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Nicholson F. Curtis, Signal Corps Aviation School, Mineola, Long Island, N. Y.



Capt. C. F. Waring on active duty at Dayton, Ohio

Dental Reserve Corps

First Lieut. Louis A. Landy, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Gerald F. Stoodly, Military School of Aeronautics, Berkeley, Cal.

Medical Reserve Corps

Maj. Atilio M. Cacini, Signal Corps Aviation School, Fort Worth, Tex.

Capt. Harold S. Arnold, physical examining unit, New Haven, Conn.

Capt. Arthur C. Bachmeyer, physical examining unit, Cincinnati, Ohio.

Capt. Edward P. Beverley, Signal Corps Aviation School, Mineola, Long Island, N. Y.

Capt. Albert F. Beverley, Signal Corps Aviation School, Fort Worth, Tex.

Capt. Adolph B. Lindquest, physical examining unit, Omaha, Nebr.

Capt. Lorenzo F. Luckie, Signal Corps Aviation School, Houston, Tex.

Capt. William H. Roberts, physical examining unit, Los Angeles, Cal.

Capt. Michael J. Sheahan, Signal Corps Aviation School, Mineola, Long Island, N. Y.

Capt. John C. Staley, Signal Corps Aviation School, Fort Worth, Tex.

First Lieut. Samuel A. Alexander, physical examining unit, Washington. D. C.

First Lieut. Foster A. Beck, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Thomas E. Blackburn, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Theodore S. Blakesley, physical examining unit, Kansas City, Mo.

First Lieut. Solomon R. Boykin, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Clyde O. Brown, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Ephraim E. Campbell, Signal Corps Aviation School, Fort Worth, Tex.

First Lieut. Ralph C. Christie, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Garrett M. Clowe, Signal Corps Aviation School, Fairfield, Ohio.

First Lieut. Montie C. Comer, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. James J. Dickinson. Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. James E. Dull, Signal Corps, Aviation School, Mineola, Long Island, N. Y.

First Lieut. Scott R. Fisher, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Philip I. Froude, Signal Corps Aviation School, Fairfield, Ohio.

First Lieut. Omer O. Gain, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Claude V. Gautier, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. John H. Hall, physical examining unit, Atlanta, Ga.

First Lieut. James M. Hammett, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Clyde C. Hardison, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Harry D. Howe, Langley Field, Hampton, Va.

First Lieut. Charles W. Hyde, physical examining unit, Washington, D. C.

First Lieut. Earl D. Jewett, Signal Corps Aviation School, Fairfield, Ohio.

First Lieut. William W. Jones, United States School for Aerial Observers, Fort Sill, Okla.

First Lieut. Ralph H. Kuhns, Signal Corps Aviation School, Fort Worth, Tex.

First Lieut. Bernard J. Larkin, physical examining unit, Indianapolis, Ind.

First Lieut. John C. Larkin, Signal Corps Aviation School, Fairfield, Ohio.

First Lieut. Robert Levy, physical examining unit, Denver, Colo.

First Lieut. Arthur J. Lewis, Signal Corps Aviation School, Fort Worth, Tex.

First Lieut. Ross D. Long, Signal Corps, Aviation School, Fort Worth, Tex.

First Lieut. Robert C. McCreery, United States School for Aerial Observers, Fort Sill, Okla.

First Lieut. Garnett Miller, Signal Corps Aviation School, Mineola, Long Island N. Y.

First Lieut. Arthur G. Neighbor, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. George A. Nylund, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Grover C. Ostrich, physical examining unit, New York, N. Y.

First Lieut. Clifford C. Parish, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. James L. Pennington, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Henry W. Pickett, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Aaron L. Roberts, Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. William L. Ross, jr., Signal Corps Aviation School, Mineola, Long Island, N. Y.

First Lieut. Bruno F. Sandow, Military School of Aeronautics, Berkeley, Cal.

First Lieut. William S. Shimer, Military School of Aeronautics, Urbana, Ill.

First Lieut. Charles P. Small, physical examining unit, Chicago, Ill.

First Lieut. Clyde T. Smith, Signal Corps Corps Aviation School, Mineola, Long Island,

First Lieut. Silas W. Williams, Signal Corps Aviation School, Fort Worth, Tex

First Lieut. Joseph Alfred L. Wolfe, Signal Aviation School, Mineola, Long Island N. Y. N. Y.

Extract Special Order 248.

First Lieuts. Leonard Romesburg and H. Turner Lewis, S. O. R. C., to report to the Chief Signal Officer of the Army for assignment.

Capt. George Stevens, Av. Sec., S. O. R. C., to Chief Signal Officer for duty.

First Lt. James Van D. Crisp, Sig. Corps, to duty at Portland, Oregon.

First Lt. George W. Delisle, Av. Sec., Sig. Corps, to duty at Hazelhurst Field, Mineola, L. I., N. Y.

Capt. Robert E. Bell, Sig. Corps, to duty at concentration camp at Morrison, Va.

First Lt. Roger B. Prescott, Sig. Corps, to Hazelhurst Field, L. I., N. Y.

First Lt. Lawrence S. Devoe, orders changed from duty at Chief Signal Office to concentration depot, Garden City, L. I., N. Y.

To duty at concentration depot, Garden City, Long Island, N. Y., for instructions: Capts. Benjamin Briscoe, Frank Briscoe, Morrill Dunn, Philip L. Foster, Ira B. Joraleman and Ferdinand C. Townsend and First Lieutenants Edwin J. Dayton, Beverly Duer, Henry B. Hobson, Roscoe L. Oatley, Stanley Smith and Averill Tilden.

Capt. Harrison H. C. Richards, Signal Corps, to report to commanding general, Southeastern Department, for duty at department aeronautical officer.

Paragraph 158, S. O. 230, relating to First Lt. Frank M. Murphy, Av. Sec., S. O. R. C., is amended to read First Lt. Frederick M. Murphy.

Capt. William F. Bonner, Medical Reserve Corps, is assigned to duty with the Av. Sec. Signal Corps, at Kelly Field, South San Antonio, Tex.

First Lt. Oliver S. Ferson, Av. Sec. S. O. R. C., to duty at concentration depot at Mineola, L. I., N. Y.

A board of officers to consist of: Capt. G. V. Hamilton, Av. Sec. S. O. R. C., and First Lt. George S. Cunningham, Medical Reserve Corps, is appointed to meet at Pittsburg, Pa., to examine applicants for commission in the Av. Sec. S. O. R. C.

Major Benjamin F. Castle, Av. Sec. Signal Corps, from duty at Kelly Field, South San Antonio, Tex., to Chief Signal Officer of the Army for assignment.

First Lt. Frank Bahel, Av. Sec. S. O. R. C., to concentration camp at Morrison, Va.

First Lt. Shiras A. Blair, Av. Sec. S. O R C., is relieved from duty requiring him to participate in aerial flights.

Creamer in Aviation Corps

Francis J. Creamer, a practising architect of Philadelphia, has been commissioned as Second Lieutenant in the Signal Corps for overseas service in near future. He is a graduate of the University of Pennsylvania, class of 1916, and was prominent in athletics while there. He won Intercollegiate swimming honors in 1913 and holds a number of championships.

Signalling To and From Aircraft by Means of Miniature Searchlights

To ensure communication between aircraft and the ground, the French army has recently introduced a novel form of miniature searchlight, operated by electricity and equipped with a telescope. When in use the searchlight is held in the hands of the operator so as to bring the telescope into sighting position. The searchlight is aimed at the aircraft with which communication is to be established and maintained, and the operator then sends the messages by means of a tapping key on the side, causing long and short flashes of light to spell out the words or numerals in the telegraph code used. By means of the telscope the operator is able to see the distant flashes of the answering searchlight, and in this manner two-way communication is maintained as long as desired.

Despite the fact that the new signalling equipment is light in weight, consisting of but the searchlight and battery, and therefore readily portable, it is said to have a range of 10,000 feet in broad daylight and considerably more than that at night.

Two Senators in London Air Raid

London.—United States Senators William S. Kenyon, of Iowa, and John B. Kendrick, of Wyoming, have passed unscathed through their second air raid experience in London. On the first occasion they were attending a dinner given at the Athenaeum Club by the Lord High Chancellor. On the second they were asleep in their suite on the seventh floor of their hotel when awakened by the bombardment.

Senator Kenyon was the first to be aroused. He jumped from bed and hurried to Kendrick's room. He awakened the Wyoming Senator, remarking:

"Senator, they are here!"

The incessant boom made further elucidation unnecessary. Kendrick leaped up and the two pajama-clad Senators hastened to the windows.

The Senators, at great risk of injury from flying shrapnel, watched the spectacle. Senator Kenyon later told the Associated Press:

"It was our first air raid experience at close



Colonel Hiram W. Bingham, in charge of Ground School activities of the Aviaton Section of the Signal Corps

quarters. We welcomed it in the sense that it nerved us for our coming visit to the trenches in France and Belgium. The thing that impressed me most was the coolness of the English people. The bravery of their women especially excited my admiration.

"I turned to Kendrick and remarked that if the people of the United States displayed the same iron nerve, which I am confident they would, the allied cause is in no danger."

American Has Nine Air Fights in Two Hours

Paris, Oct. 31.—Nine fights in the course of a two hours' patrol flight is the record established by Sergeant David McKay Peterson of the Lafayette Flying Squadron. Sergeant Peterson, whose home in in Honesdale, Pa., drove one of his adversaries to earth, following him down and continuing to fire as long as the German remained in sight. The German machine probably was destroyed.

Lufbery Cited in Despatches

Lieutenant Raoul Lufbery has just been cited in orders to the fighting group to which the Lafayette Squadron belongs for his fine work on Oct. 26, when he drove down two German machines which landed in their own lines, with the pilot of one of them apparently killed.



Major Arthur R. Christie, on active duty with the Aviation Section of the Signal Corps. "Somewhere in France"

American Who Got French War Cross Joins U. S. Aviators

Lenox, Mass.—George Turnure, Jr., cabled from Paris to his parents, Major and Mrs. George E. Turnure, that he has been appointed a First Lieutenant in the United States Army Signal Corps, Aviation Department, and that he had received from the French Government a war cross for an aerial victory.

Lieut. Turnure went to France last January and joined a French escadrille, of which the late Capt. George Guynemer was a member. He had been flying for the French since June.

A camouflage company of the U. S. Engineers gave a special exhibition of their work for President Wilson and Secretary Baker and several high Army officers at a training camp near Washington on Oct. 31. The unit showed how artillery, roadways, streams and even troop movements are concealed.

Brig. Gen. C. G. Hoare, commander of the Canadian Division of the British Royal Flying Corps, established his headquarters at Fort Worth, Texas, on Oct. 29 for the winter.

Extracts from Special Orders, 252

First Lieuts. Edward G. B. Fox, Hugh B. Crague, and Walter A. Schmidt, Signal Officers' Reserve Corps, to Camp Devens, Ayer, Mass., for duty with 301st Field Signal Battalion.

First Lieuts., S. O. R. C., Charles B. Glann, Fred T. Coles, Donald McLean, Edward L. Chapin, and Harold F. Cotter to duty with 302d Field Signal Battalion, Camp Upton, Yaphank, Long Island, N. Y.

First Lieut. Charles B. Arrington, Hubert S. Turner, Warren C. Taylor, and Harold W. Webb, to duty with 304th Field Signal Battalion, Camp Mead, Annapolis Junction, Md.

Capt. Harold E. Brabant and First Lieuts. Harry L. Miller, Paul L. Rittenhouse and Edward F. Roosevelt, to duty with 303rd Field Signal Battalion, Camp Dix, Wrightstown, N. J., of the Signal Officers' Reserve Corps.

First Lieuts. Robert A. Miller, Clarence R. Fischie and Edward L. Clark, S. O. R. C., to duty with the 401st Telegraph Battalion, Camp Devens, Ayer, Mass.

First Lieuts. Walter E. Ballard and Charles E. Creecy, S. O. R. C., to duty with 403d Telegraph Battalion, Camp Sherman, Chillicothe, Ohio.

First Lieut. Joseph G. Halsey, Av. Sec., S. O. R. C., to school for aerial observers, Fort Sill, Oklahoma.

First Lieut. Robert D. Duncan, S. O. R. C., to report to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. David T. Hargan, S. O. R. C., to the Chief Signal Officer of the Army for duty.

Contract Surgeon, Robert S. McCombs, United States Army, to duty with the Aviation Section, Signal Corps, at Chandler Field, Essington, Pa.

Major John W. Butts, junior military aviator, Signal Corps, detailed member of officers, to meet at Mineola, Long Island, N. Y., to examine officers to determine their qualifications for rating as junior military aviators.

Capt. Clifton A. Brode, Signal Corps, to Kelly Field, South San Antonio, Texas.

Capt. Joseph N. Barney, Medical Reserve Corps, to duty at Aviation concentration camp, Mineola, Long Island, N. Y.

Major Thurman H. Bane, Signal Corps, to report to the Chief Signal Officer of the Army for assignment to duty.

Major Charles N. Sawyer, Signal Corps, for duty at Camp Alfred Vail to Camp Beauregard, La.

Major Charles T. Warring, Signal Corps, temporary duty at Washington, D. C., and then to Langley Field, Hampton, Va.

First Lieut. Lilburn H. Steel, Signal Corps, to Camp Alfred Vail, Little Silver, N. J.

First Lieut. Frederick P. Clement, Jr., Av. Sec., S. O. R. C., to school for aerial observers, Fort Sill, Oklahoma.

First Lieut. George G. Dunn, Jr., Av. Sec., S. O. R. C., to aviation camp and supply depot, Garden City, Long Island, N. Y.

First Lieut. Sidney T. Moore, Av. Sec., S. O. R. C., to Kelly Field, South San Antonio, Texas.

Orders relating to First Lieut. Adelbert Ames, Jr., Av. Sec., S. O. R. C., amended to read First Lieut. Adelbert Ames, Jr., Signal Corps, United States Army.

The following named officers, Av. Sec., S. O. R. C., are announced on duty requiring them to participate regularly and frequently in aerial flights from following dates: Capt. Thomas Hitchcock, Oct. 16, 1917; First Lieut. Algernon R. Clapp, Oct. 12, 1917; First Lieut. J. Sloan Roberts, Sept. 20th, 1917; First Lieut. Joseph V. Burne, Sept. 19, 1917; First Lieut. Byron H. Mills, Oct. 8, 1917.

Capt. Will G. Merrill, Medical Reserve Corps, relieved from present duties with the Signal Corps, Av. Sec., Fairfield, Ohio, and will report to commanding general thereof for duty with the squadron at that station, and by letter to the commanding general, Aviation Section, Signal Corps, Washington, D. C.



The Latest Fiat Engined Pomilio Biplane

METAL IN AEROPLANE CONSTRUCTION

By A. POMILIO

METALS—In aeroplane construction the following metals are employed: Steel, aluminum, copper and its alloys. We will discuss briefly the properties and use of each.

Steel—Steel is the metal having the highest specific resistance, *i.e.*, it is the material having the greatest strength per given weight. Steel is used not only for wire stays, cables, bolts, turn-buckles, motor base plates, etc., but also for the special tubing employed in the landing gear or chassis the fuselage and wings.

The following table gives one of the common classifications of steel:

STEEL	Elastic Limit in ℔/sq.in.	Ultimate Resistance in ℔/sq.in.	Percent longation
Extra soft	31,250—36,550	49,700— 56,800	32—28
Soft	36,550—41,200	56,800— 68,200	28—24
Medium-soft ..	41,200—46,800	68,200— 78,200	24—21
Medium-hard ..	46,800—51,150	78,200— 92,400	21—18
Hard	51,150—56,800	92,400—106,600	18—15
Very hard	56,800—61,100	106,600—120,700	15—10
Extra-hard	61,100—63,900	120,700—141,900	10— 5

For members subject to abnormally high stresses; steel of high percent elongation should be used.

(*Soft and Medium Soft*)—The working stress allowed varies from 1-6 to 1-10 of the ultimate resistance.

The special steels, such as nickel, chromium, tungsten, and vanadium steels have a very high ultimate resistance and good elastic properties (high percent of elongation). These high grade steels are used for cables, wire stays and tubing, and are very expensive.

The steel used in the manufacture of pivots, bolts, turn-buckles and members subject to high impact stresses or to strong vibration, must have a minimum percent of elongation of 22 and must pass a cold bending test to an angle of 60° and back to 180° without developing any weakness.

Steel sheets must be of uniform thickness and homogeneous in structure, and must not show cracks. They must possess the same qualities as steel bars. The percent of elongation of steel sheets is about 9-10 that of steel bars.

Having discussed the properties of steel we will now pass on to the various forms in which it appears to us in a finished machine (wire stays, cables, bolts, turn-buckles and special shapes).

The wire stays or piano strings, are manufactured from high grade crucible steel, having an elastic limit of 56,800 #/sq.in., an ultimate resistance of 127,700 #/sq.in., and a percent of elongation of 8. They must be of uniform diameter and must offer the same resistance at every section. The wire is then either tin plated or galvanized. Galvanizing is the better process, because if the tin plate wears off at any point, a tin-iron galvanic couple is formed, which decomposes water according to the well-known reaction. The iron acting as a positive pole gathers oxygen and so begins to rust. If the zinc wears off the galvanized wire, we have a similar reaction, but, in this case, the oxygen is developed on the zinc while the hydrogen forms a protecting film on the iron.

Besides being tested for tension, piano strings are subjected to a fatigue test. The wire is held fast in a specially made vice having rounded jaws. It is then bent back and forth through an angle of 180°, for a number of times.

In the following table may be found results of tests made on piano strings selected for use in aeroplane construction:

Diameter in 1/1000″	Weight in ℔ per ft.	Length in ft. per lb. of wire	Ultimate Resistance in ℔/sq.in.	No. of times wire is bent in a vice with jaws rounded to a radius of 0.197″	
39.3	0.00417	240	312,500	36	105
59.1	0.00942	106	291,500	27	50
70.8	0.01355	74	277,000	13	32
78.7	0.01680	60	269,500	11	29
90.6	0.02220	45	255,500	9	23
98.4	0.02625	38	248,500	8	22
106.3	0.03060	33	248,500	7	17
118.1	0.03715	27	241,500	6	14
137.8	0.05133	19.5	234,200	5	11
157.5	0.06710	15	234,200	4	9
177.5	0.09180	10.5	227,000	3	5
196.9	0.10450	9.5	220,000	3	4

Steel cables are formed of wires whose unit ultimate resistance varies from 255.500 to 341.500 #/sq.in.

It might be interesting to glance over the following table giving the diameter, weight, and ultimate strength of several types of cables.

CABLES	Diam. in 1/1000″	Braking load in ℔	Weight in ℔/100 ft.
One strand wholly of metal, 16 wires of tempered and galvanized steel of 284,500 #/sq.in.	39.3	528	0.0037
	59.1	594	0.0080
	70.8	772	0.0107
	98.4	1,063	0.0195
	118.1	2,398	0.0282
	157.5	4,180	0.0537
Seven strands, wholly of metal, 7 wires per strand of tempered and galvanized steel of 284,500 #/sq.in.	78.7	638	0.0107
	94.6	1.013	0.0168
	110.2	1.498	0.0222
	126.0	1,985	0.0302
Seven strands, wholly of metal each of 19 wires of tempered and galvanized steel of 284,500 #/sq.in. Extra flexible.	126.0	1,608	0.0268
	157.5	2,535	0.0436
	185.3	3,630	0.0570
	224.5	5,280	0.0805
	248.0	6,620	0.1050
Twelve strands of 19 wires extra, — Extra flexible.	248.0	7.040	0.0974
Seven strands of 19 wires of high resistance steel (341,500) #/sq.in. Extra flexible.	126.0	1,985	0.0268
	157.0	2,865	0.0436
	185.3	4,410	0.0570
	224.5	5.940	0.0805
	248.0	7,720	0.1050
Twelve strands of 19 wires extra — Extra flexible.	248.0	7.930	0.0974

(*Continued on page* 391)

PROPERTIES OF VARIOUS WOODS

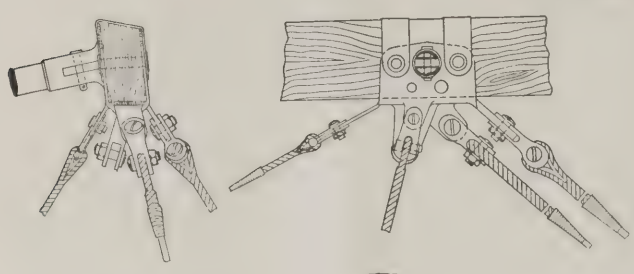
Compiled by A. Pomilio

Strength Values at 15 per cent. Moisture, for Use in Aeroplane Design

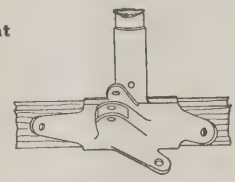
Common and Botanical Names	Specific gravity based on volume & weight when oven-dry		Weight at 15 per cent. *moisture*	Shrinkage from green to oven-dry condition		Fiber stress at *Elastic Limit*	Modulus of *Rupture*	*Modulus of Elasticity*	Work to maximum *Load*	Compression parallel to grain Maximum Crushing *Strength*	Compression perpendicular to grain Fiber stress at *Elastic Limit*	Shearing Strength Parallel to grain	Hardness side Load required to imbed 0.444-inch ball to ½ its *Diameter*
HARDWOODS	*Average*	*Minimum permitted*	Lbs. per cu.ft.	*Radial*	*Tangential*			1,000 lbs. per sq. inch.	inch lbs. per cu. in.				
				Per cent.		Pounds per square inch				Pounds per square inch			Pounds
Ash, commercial white (Fraxinus americana, " lanceolata, " quadrangulata)	.62	.56	40	4.5	7.1	7,700	12,700	1,500	14.2	6,000	1,300	1,750	1,150
" black (Fraxinus nigra)	.53	.48	35	5.0	7.8	5,800	10,500	1,400	14.1	4,900	800	1,350	740
Basswood (Tilia americana)	.40	.36	25	6.6	9.3	4,700	7,200	1,300	6.4	3,800	400	880	340
Beech (Fagus atropunicea)	.66	.60	41	4.8	10.6	7,400	12,600	1,500	13.3	5,900	1,100	1,700	1,060
Birch (Betula lutea, lenta)	.67	.61	43	7.0	8.5	8,400	13,500	1,800	17.6	6,600	1,000	1,620	1,070
Cherry, black (Prunus serotina)	.53	.48	35	3.7	7.1	7,300	10,600	1,400	12.0	5,800	700	1,500	830
Cottonwood (Populus deltoides)	.43	.39	28	3.9	9.2	4,500	7,000	1,200	7.3	3,800	400	800	380
Elm, rock (Ulmus racemosa)	.66	.60	44	4.8	8.1	6,700	12,500	1,400	19.3	5,800	1,200	1,650	1,200
Gum, red (Liquidambar styraciflua)	.53	.48	34	5.2	9.9	6,700	10,400	1,400	11.0	4,900	700	1,500	650
Hickory (true hickories) (Hicoria glabra, laciniosa, alba, ovata)	.81	.73	50	7.3	11.4	8,900	16,300	1,900	28.0	7,300	1,800	1,800	.....
Mahogany (true) (Swietenia mahagoni)	.54	.50	36	3.5	4.2	7,000	10,000	1,300	9.1	5,500	1,000	1,420	860
" African (Khaya senegalensie)	.50	.46	34	4.8	5.5	7,100	10,400	1,400	10.3	5,100	900	1,270	730
Maple, hard (Acer saccharum)	.66	.60	42	4.8	9.2	8,100	12,900	1,600	12.9	6,500	1,200	1,990	1,200
Oak, commercial white (Querous alba, macrocarpa, minor, michauxii)	.72	.65	46	5.3	9.2	6,700	12,000	1,400	12.7	5,900	1,300	1,760	1,270
Poplar, yellow (Liriodendron tulipifera)	.42	.38	28	4.1	6.9	4,800	7,500	1,300	6.2	4,100	400	900	370
Walnut, black (Juglans nigra)	.56	.52	38	5.2	7.1	7,900	11,900	1,500	13.1	6,100	1,000	1,300	950
Conifers													
Cedar, incense (Libocedrus decurrens)	.36	.32	26	3.3	3.7	4,900	7,100	1,000	6.0	4,300	600	850	430
" Port Orford (Chamaecyparis lawsoniana)	.47	.42	31	5.2	8.1	6,200	10,300	1,700	9.7	5,300	700	1,160	580
" western red (Thuja plicata)	.34	.31	23	2.5	5.1	4,200	6,400	1,000	5.5	4,000	400	790	300
" white (northern) (Thuja occidentalis)	.32	.29	22	2.1	4.9	4,200	5,800	750	5.1	3,400	350	800	300
Fir, Douglas	.52	.47	34	5.0	7.9	6,800	9,700	1,780	7.2	6,000	750	1,020	580
Pine, sugar (Pinus lambertiana)	.39	.36	27	2.9	5.6	5,300	7,400	1,100	5.0	4,300	540	950	410
" western white (Pinus monticola)	.45	.40	29	4.1	7.4	5,100	7,800	1,400	6.9	4,800	480	670	360
" white (Pinus strobus)	.39	.36	27	2.2	5.9	5,100	7,400	1,200	6.1	4,500	530	850	380
Spruce, red, white, sitka (Picea rubens, canadensis, sitchensis)	.41	.36	27	3.9	7.5	5,100	7,900	1,300	7.4	4,300	500	920	430
Cypress, bald (Taxodium distichum)	.47	.42	31	3.8	6.0	6,100	8,800	1,300	6.8	5,400	670	940	460

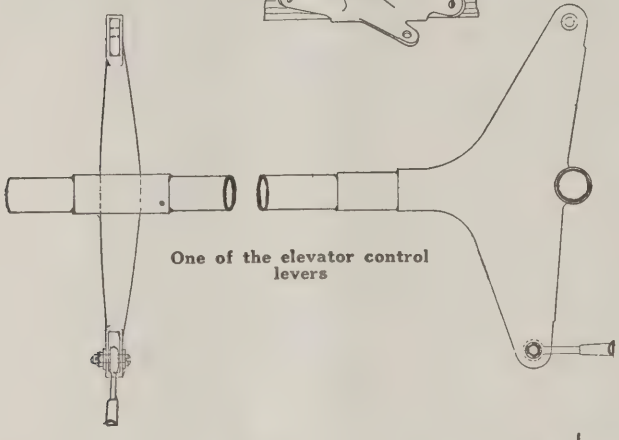
DETAILS OF THE AUSTRIAN HANSA-BRANDENBURG TRACTOR

(Continued from last week)

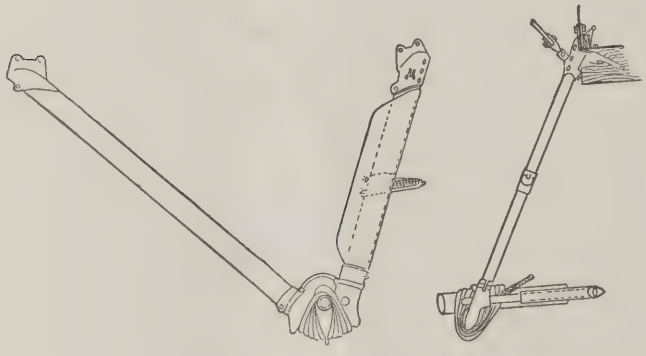


Strut fitting at the front spar, upper left wing

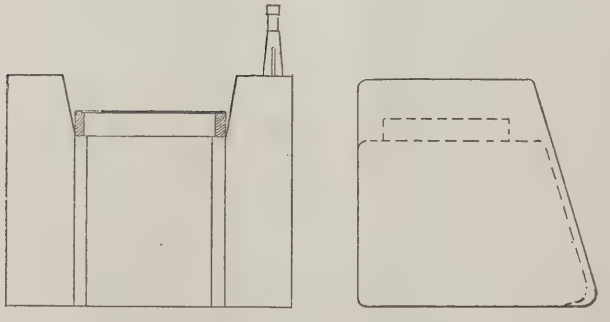


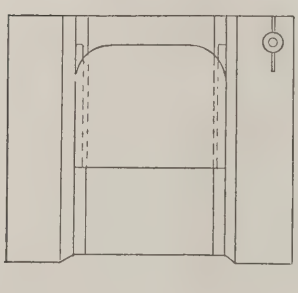


One of the elevator control levers

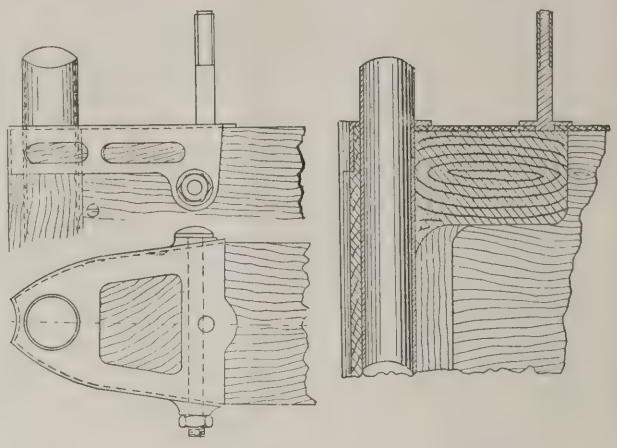


Landing chassis

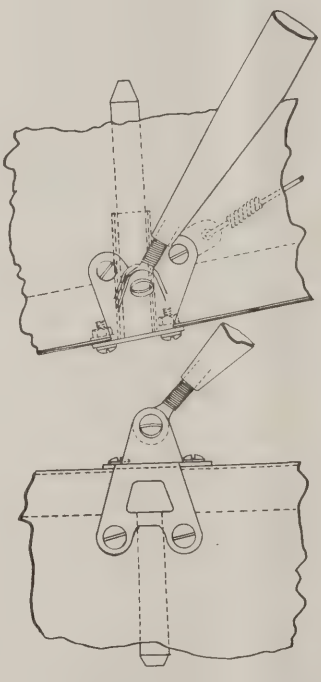




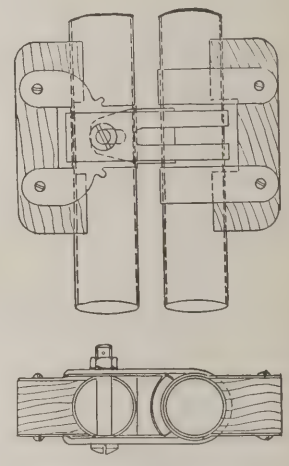
Front, side and top views of the main fuel tank, upon which the pilot's seat is placed



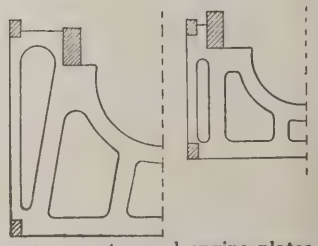
Rear attachment of the tail plane to the fuselage



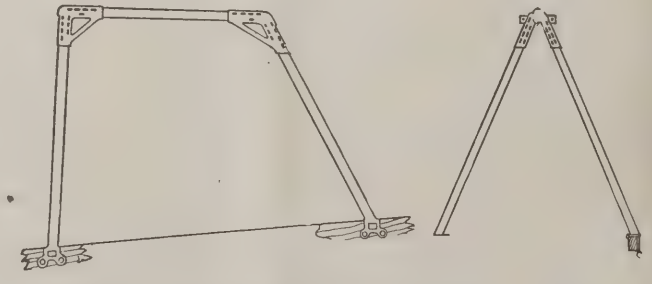
Lower end of the brace from the tail plane to the fuselage



Aileron and tail flap or stabilizer hinges



The two forward engine plates



The steel-tube cabone running from the fuselage and carrying the upper plane

BUREAU OF STANDARDS NEW AERONAUTICAL LABORATORIES

THE work the Bureau of Standards in Washington is doing in promoting scientific research is well illustrated by the recently completed low-pressure engine-testing laboratory. This laboratory was designed for the testing of aeroplane engines under conditions met with at high altitude, but it is also available for scientific research work of the Bureau whenever conditions of low pressure and low temperature are required.

The laboratory building has been practically completed, and the apparatus is so nearly installed that it is expected that testing work will be started in a few days. The location is at the west end of the Gage Standardization Building.

The outer building is a 24 by 50-ft. stucco structure. The vacuum chamber inside this is 6 by 6½ by 15 ft. high, with a wall 12 in. thick, made of concrete reinforced with steel and lined with cork.

The air passing into the chamber can be controlled by hand and automatic throttle valves, so that its pressure ranges from atmospheric down to about one-half an atmosphere, or the equivalent of the pressure at an altitude of 20,000 ft., and can be precooled to temperatures approximating those occurring at that altitude. It will be possible thus to approximate actual operating conditions over a wide range.

The exhaust from the engine will be piped into a chamber outside the test compartment, this being kept at low pressure by means of a large rotary exhaust blower, which also withdraws air from the test chamber itself. The exhaust is cooled by water injection before passing to the blower.

The refrigerating system consists of a large machine of the ammonia type of 25 tons capacity, belt-driven by a 40 h.p. electric motor. Large refrigerating coils are placed both in the vacuum chamber and in the outer room, so that the air passing into the chamber can be cooled as much as is desired. In order to cool the air it is first drawn through the coils outside the chamber, and when inside the vacuum chamber it can be piped directly to the carbureter or led to the interior and allowed to find its way through the carbureter.

The air inside the chamber is circulated by fans driven by electric motors, one object of this circulation being to attain high air velocity over the engines and another to carry away the heat radiated from the engine and exhaust manifolds and absorb it in the refrigerating coils inside the chamber. After the air is cooled while passing through these coils, it is again circulated over the engines.

The exhaust from the engines is led into water-jacketed pipes, connected with the individual cylinder exhausts. Water in turn is led directly into this water-jacketed pipe in order to cool the exhaust. These pipes from the cylinder exhausts lead to headers, which in turn are connected to tanks outside the vacuum chamber. The tanks serve to eliminate pulsations from the exhaust. The exhaust is then led to the vacuum pump located in the outer chamber. The water flowing out with the exhaust is siphoned out when the mixture passes through the vacuum tanks.

The engine to be tested will be placed inside the vacuum chamber, being mounted on supports similar to those used in aircraft. An electric dynamometer with control mechanism is located in the outer chamber. This dynamometer has a normal rating of 300 h.p., with a 30 per cent overload capacity.

It is expected that it will be possible in this new laboratory to control absolutely the temperature and pressure conditions in the vacuum chamber, thus enabling aviation engine performance to be practically duplicated under conditions when measurements can be made. Thermo-couples can be placed at various points in the vacuum chamber and the indicating mechanism placed outside so that exact temperature readings can be taken at any time for almost any point in the engine. Different kinds of carbureters can be installed, so that their performance can be tested.

Provision is made for measuring amounts of air, fuel and water together with their temperatures, so that complete heat balances can be computed for all operating conditions. Adequate equipment for many other supplentary measurements, such as compression and explosion pressures and incidental pressures and temperature, have been provided.

Construction of Wind Tunnel

In connection with the design of aeroplanes, structural members and aeronautic instruments, as well as for many other purposes, experiments must be made in air at high velocities and under conditions which can be controlled. The usual method of performing such experiments is by means of the so-called wind tunnel or wind channel of suitable size and construction. Such an equipment requires a considerable amount of space and special apparatus.

The Bureau of Standards has had under consideration for several years the construction of a wind tunnel for general aeronautic experiments, but construction has not been undertaken until recently, as other problems have seemed to be of more immediate importance. Early in the summer plans were perfected for the construction of a special building to house a wind tunnel and a moderate amount of laboratory space to be used in connection with the wind-tunnel observations. This building, approximately two-thirds completed, is 90 ft. long, 30 ft. wide and 23 ft. high, and is of brick and stucco construction, the brick walls extending to the window sills. About 65 ft. of the length of this building to the full height is set aside for the housing of the wind tunnel proper. The remaining 25 ft. of length is divided into two stories with two small rooms on the first floor and a single drafting room on the second floor.

The wind tunnel is to be of open-end continuous type, constructed, however, so that it can be readily transformed into an Eiffel-type tunnel when desired. The wind channel will be 4 ft. in diameter and of octagon section, as the octagon section combines some of the advantages of both the square and circular type of construction. The air blast for the tunnel will be furnished by means of a conventional aeronautic propeller directly connected to a 75-horsepower motor, and air velocities up to 60 or 70 miles an hour are expected. Comprehensive plans have been made for special wind-tunnel balances, which, it is hoped, will add materially to the accuracy and convenience of observations of this nature.—*S. A. E. Journal.*

THE STRUCTURE OF BALL BEARING STEEL

THE majority of ball bearings are composed of chrome steel, one of the most valuable alloys ever produced. This steel is treated in such a manner that, as a rule, good balls do not vary in diameter more than one ten thousandth of an inch.

Anyone who is familiar with the manufacturing processes will appreciate the great endeavors made to ensure accuracy and efficiency. Theoretically, the balls are practically incompressible and indestructible, but, practically, many fail, and in doing so upset the proper running of the remainder.

Chromium is an intensely hard, yet somewhat brittle, highly crystalline and brilliant, silvery white metal, while true iron, which is known as ferrite, is rather soft and ductile. It is the carbon ingredient that is chiefly responsible for converting iron into firm, serviceable steel.

When chromium is melted with iron in suitable proportions it confers its hardness on the iron, while the iron nullifies the tendency to brittleness possessed by chromium. The compound consists primarily of a double carbide of iron and chromium, in which some of the carbon in the iron unites chemically with that metal to evolve carbide of iron; while some of it joins up with the chromium and yields carbide of chromium. Both carbides are usually dissolved in each other.

The resulting compound is called cementite, that being the name for the double carbide. Cementite is one of the densest, most compact, and resistant substances obtainable. It occurs in ordinary carbon steels as a carbide of iron alone; and it is because of the presence of carbide of chromium in addition that so much strength is inherent in chrome steel.

Other common constituents of chrome steel are martensite and austenite, the first being composed of minute crystals of cementite and iron; while the second is similar in character, but differently proportioned. These compounds are found also in other less effective steels.

The customary additions of chromium and carbon in special steels range between 1% and 3% of chromium, and 0.5% to 1.5% of carbon.

Chromium is usually added in the form of ferro-chrome, which is generally an alloy of iron with 50% to 65% of chromium and 5% to 9% of carbon. This is, as it were, diluted with steel, until the latter contains the proportions given in the preceding paragraph. Only a comparatively small amount of ferro-chrome has to be melted up with ordinary steel to render the latter very tough. Different founders have their own recipes.

The carbon in steel is derived either from the coal and coke fuel of the furnaces, or from charcoal caused to be absorbed by the hot metal. It may separate free as graphite, or combine as carbide. Elemental metals crystallise when cooling and hardening from the molten condition. Most of the crystals are of minute dimensions, and there is naturally less cohesive strength among the grains or particles in these circumstances than would exist if the metals became homogeneous solid masses. Some idea of the matter will be gathered by considering the behavior of sugar. If this syrup is poured out when heated to a certain temperature it will gradually resolve itself into an adhesive collection of small crystals—a candy, really—and the bulk can be easily broken. If, however, the temperature be increased, the resultant fluid will set into a firm, amorphous toffee, which is an homogeneous hard lump, resisting ready breakage. This analogy has its limitations, but it will help to explain what takes place.

When two or more metals are alloyed they may both crystallise minutely, but form strong

(*Continued on page* 391)



FIGURE 1

One-fortieth part of an inch of the ordinary smooth, polished surface of a bearing ball



FIGURE 2

One-fortieth part of an inch of the grooved surface of a bearing ball. The outer metal has been worn away, leaving semi-crystalline ridges and hollows, into which grit is forced.



FIGURE 3

One-fortieth part of an inch of a bearing ball still deeper down. Comparatively wide crevices alternate with jagged granular masses.

AVIATION—THE ENGLISH AIRCRAFT POINT OF VIEW

Being an Interview with Basil Bancroft, of Whitehead Aircraft, Ltd., England

MR. BANCROFT is in America on behalf of the Whitehead Aircraft Company, Ltd., of Richmond, Surrey, England. He is one of the officers of the Corporation, and is known as their American representative. He is a sound logical talker and graphically described, from a man in the field's point of view, the great advantage of air armament.

To illustrate he says: "With our terrible situation in Loos Wood, during the Battle of the Somme, with eight days and nights fighting,



Mr. J. A. Whitehead, head of the Whitehead Aircraft, Ltd.

barely a few hours sleep, three days without food and in addition, two days without water. I often thought what we would have done if we had a thousand fighting aeroplanes to assist us in the advance we were making. If we could have sent forward a thousand fighting aeroplanes, think of the lives we would have saved, the suffering that would have been eliminated, and what is also important, the tremendous gains of ground we would have been able to accomplish.

When you figure that it took fourteen months to advance five miles, at this rate of progress, parodoxically speaking, it would take 120 years to end the war, unless we devise another method. The majority of the greatest military and naval tacticians of today, concur that the ending of this war is by aerial warfare. This being the case, the solution is quantity, quality and expediency for fighting aeroplanes. Who can get there first, as regards production. Germany, Austria, or the Allies?

The Germans are holding their ground; you see today the results of their efforts both in Italy and Russia. The sea question is tied up. At the present rate of progress, the land rate is obvious. The war must be fought out to a finish in the air.

If Germany and the Central Powers could complete their air fleets before we do and send them over England and across the seas to America, we will have to give up. There is just one way to my mind that we can bring Germany to her knees. The combined affairs of England and America must be bracketed into working order. Five thousand aeroplanes must be put into action quickly; there must be a bigger type of machine than is on the market at present and our progressive inventive geniuses must be given the greatest encouragement. We must not be satisfied with the present type of machine. Improve, improve and continue to improve until we acquire a powerful weapon of destruction."

All the efforts of The Whitehead works are concentrated on fighting aeroplanes, we make no student machines. Our governing director, Mr. J. A. Whitehead, who by the way, is also an American and by peculiar coincidence like myself, a Californian, is of an extraordinary personality. He organized his corporation less than two years ago, with a staff of seven (7). Today the capital is over $6,000,000 and staff nearly 5,000. Our progress has been most remarkable and rapid.

"When I left Mr. Whitehead, he instructed me to openly invite any American air concern to use our works and assemble their machines, and thus they will eliminate a most difficult problem of delivering completed aircraft by ocean traffic.

"I have been in the firing line and during my seven months in nine different hospitals, I have seen a great deal of human suffering. Millions have been killed and physically incapacitated. I shudder to think that American boys should go through the same hardships, already experienced in this terrible war by me and my comrades. The paralytic cases in the hospitals are terrible examples of human suffering. Deaf, dumb and blind, without a vestige of intelligence left, these poor unfortunate heroes laying on day by day, fed by artificial means, with no power or control over the functionary organs. I need not go into further lengthy de-



Mr. Basil Bancroft, American representative of the Whitehead Aircraft, Ltd.

tails of all the fine manhood of the Allies crippled for life. Millions of them. Will America escape the replica of this? It behooves the American public government and officials that the answer to this is *fighting aeroplanes.*"

Council of National Defense Moves Into Temporary Office Building Erected for It

The temporary office building now occupied by the Council of National Defense, its advisory commission, and the subordinate committees of both bodies, including the War Industries Board, at Seventeenth and C Streets, Washington, D. C., contains slightly in excess of 100,000 square feet of space, with heating, toilet and fire-protection facilities customary in office buildings.

The type of construction is wood frame, with wire lath and stucco exterior, and wall-board finish inside. The two main factors governing the plan and erection of the building were economy and speed of construction, as less then 60 days were allowed from the time construction was to have been started until the offices were to be occupied. As a matter of fact, the work was started on the 4th of September and on the 23rd of October the occupants moved in, a lapse of 49 days, not deducting for Sundays, holidays, or bad weather. No night work was done.

The construction required over a million board feet of lumber, and the maximum labor employed was 450 workmen and mechanics of all classes. The cost of the completed structure will be under $225,000, at the rate of less than $2.25 a square foot of space, which is comparable with office rent paid for one year in many cities. So that it is fair to say that if the building is occupied for two years it will save its entire cost in office rent.

The new building will house upward of 600 persons in the personnel of the council and its subordinate bodies. Aside from this, office space has been given to the representatives of the purchasing commissions of the allied Governments.

The plans were prepared by Waddy B. Wood, the architect of Washington, to whom much credit is given by the Council's committee on emergency construction and contracts which directed the job. He was confronted with the difficult problem of reconciling a minimum expenditure of money with the requirement that a pleasing exterior and a practical interior arrangement be secured. The contract for the construction was awarded to the George A. Fuller Co., operating under the same form of contract used in the construction of the cantonments. So far as is known, no similar structure has ever been attempted, i. e., a building which combines the features of temporary frame construction with the characteristics of permanent office building construction.

Aerial Postal Service For Soldiers

Washington.—Aerial postal service between the American troops in France and their British and French comrades, with an extension to Algeria and Morocco, is arranged by the municipal post authorities at Lyons. A cable message received here says a commission has been appointed to study the question of routes and sailing times for the service.

THE HOWARD AVIATION ENGINE

Raymond M. Howard, mechanical engineer, of Detroit, Mich., has designed a twelve-cylinder, 60-deg. type, vertical, water-cooled airplane engine, having a propeller speed of one-half the crank-shaft speed. The engine has a displacement of 1,145 cubic in., the bore being 4½ in. The power output should be 200 hp. at 2,000 r.p.m. and 300 hp. at 3,000 r.p.m., according to the designer. The engine is featured by compactness of dimensions, the over-all length being 58 in.; the width, 38 in.; height, 33 in.; width at bed, 17 in.; and the height from bed, 21 in.

The crankcase and both rows of cylinder water jackets are one integral aluminum casting. Part of the inlet manifolds are cast in this block, and the crank-shaft bearings are supported by webs and the entire case is ribbed. The cylinders are steel sleeves machined all over and ground and held in place by the cylinder heads.

Aluminum is used for the cylinder heads, and they contain part of the inlet manifolds and exhaust ports. The valve seats are of cast iron and are cast in place, provisions being made for two spark plugs per cylinder. These enter horizontally and are on the outside of the cylinder heads.

Exhaust and inlet valves are 2¼ in. in diameter and are made of tungsten steel, the stems being large and drilled hollow for lightness. The valves are placed at the angle shown in the section, which allows the use of one cam to operate one pair of valves. This is said to be a new feature.

For the camshaft housing an aluminum casting is used. It is ribbed and bolted to the cylinder block and it also carries the tappets and tappet bushings. The pistons are of the hour-glass type and are made from aluminum alloy, and the heads are deeply ribbed for cooling and strength. Two Burd rings are provided. The wrist pins are of large diameter and are made of chrome vanadium steel, hardened and ground and are hollow. They are clamped in the upper end of the connecting rod and work in bearings in the piston.

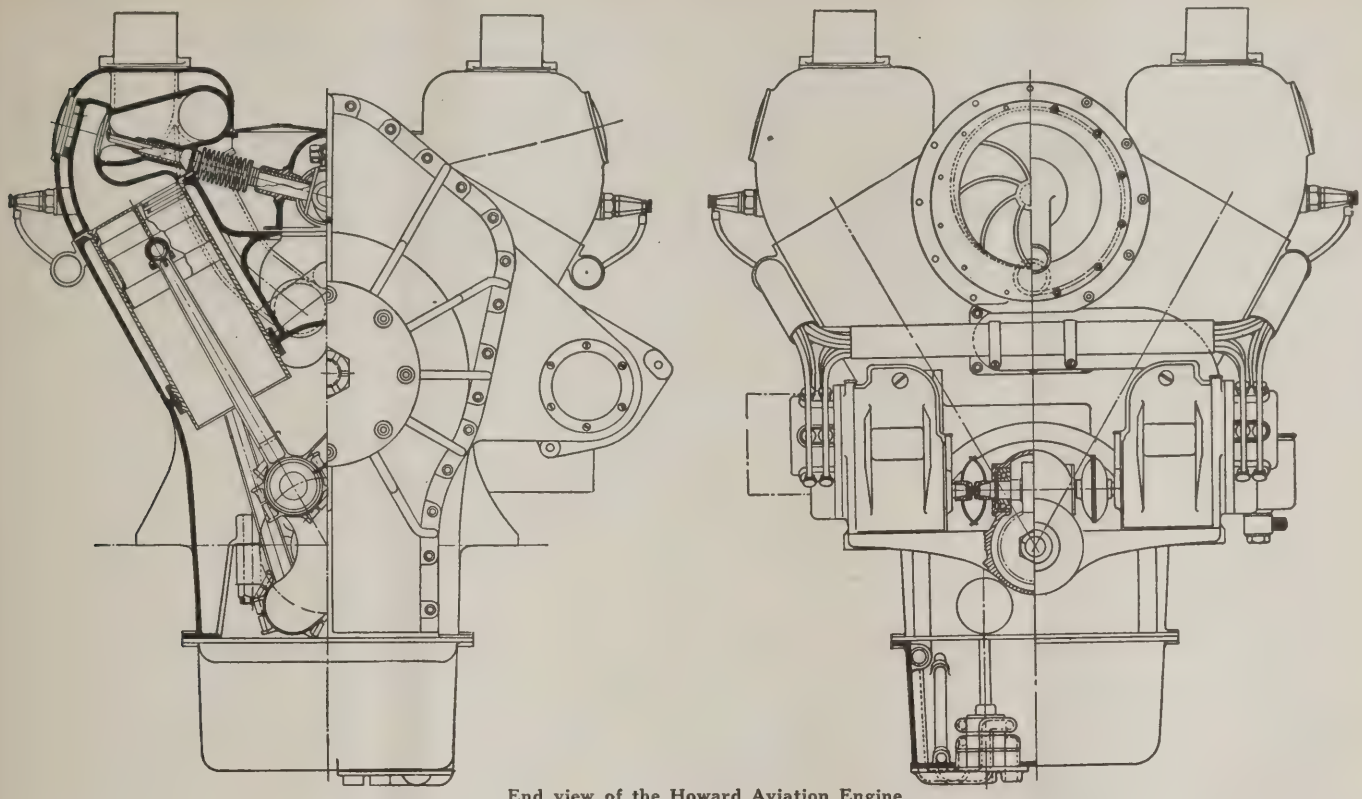
The crankshaft is of the three-bearing type, and is made of chrome vanadium steel, heat treated and machined all over. The connecting rod pins are drilled hollow for lightness and for oil passages, all pins and bearings being ground. The crankshaft is mounted on three large S. K. F. self-aligning ball bearings.

Has Compression Release

The camshaft is also made of chrome vanadium steel, heat treated, hardened and ground, and is drilled hollow for lightness. There are twelve integral cams, and the camshaft is driven by the propeller shaft with the aid of a Morse chain, and is mounted on two S. K. F. self-aligning ball bearings, with plain bearings in the center. All bearings are oiled under pressure.

Fork type rods are used. They are made from chrome vanadium steel forgings and machined all over. The connecting rod bearings are made of Fahrig white metal, bronze backed.

A compression release is provided, which raises all the exhaust valves simultaneously, therefore making it easier to start and allow the proper means of stopping. A duplex Zenith carbureter is used.



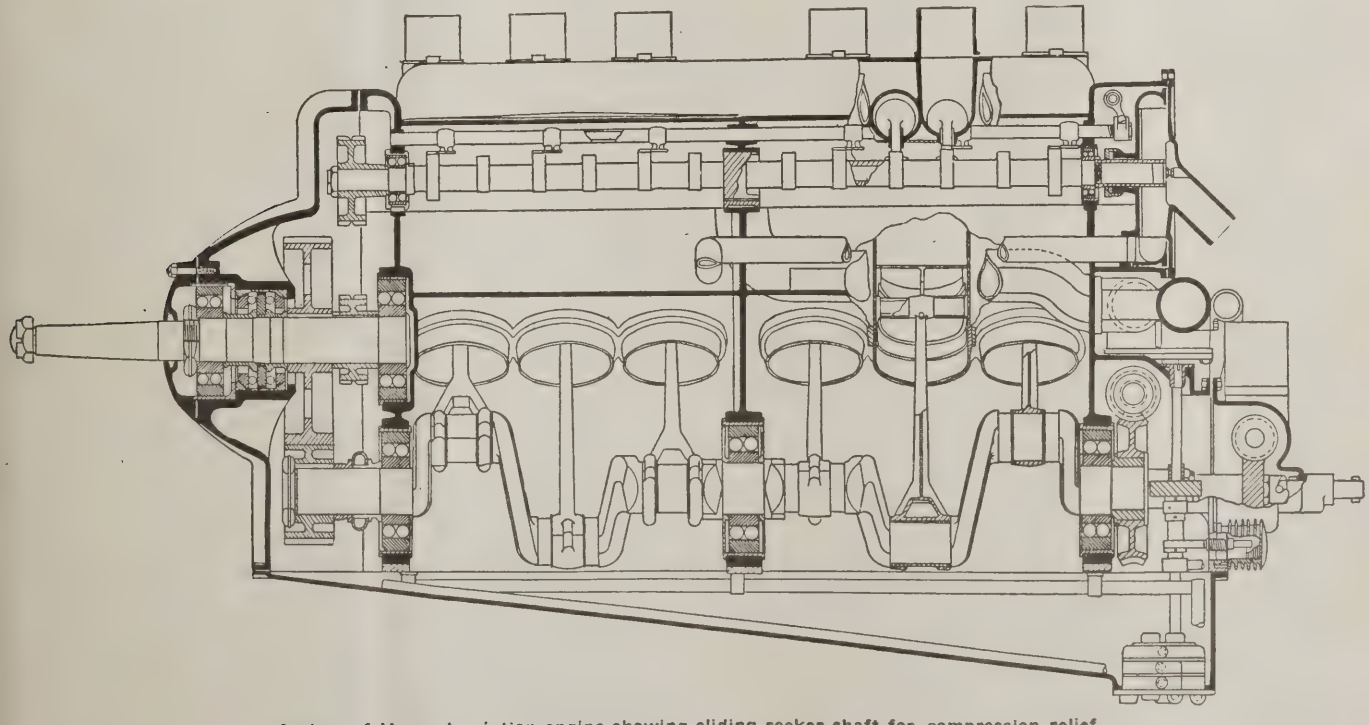
End view of the Howard Aviation Engine

The propeller shaft is driven from the crankshaft through spur gears of chrome vanadium steel. It is carried on two large S. K. F. ball bearings, which are housed in the aluminum gear case. As S. K. F. ball bearing takes care of the thrust of the propeller.

Bijur starting and lighting is provided. The starting system has been arranged so the Bijur electric starter cranks the motor by the aid of a worm-gear mechanism, which is also claimed to be a new feature. A tachometer and air pump are fitted and are driven by the oil pump shaft at the magneto end of the motor. Two twelve-cylinder Dixie magnetos are also provided, each having an entirely separate system of wiring and plugs.

A centrifugal water pump is used. It is made of aluminum and is of ample capacity to cool the motor under excessive load, with the proper size radiator. The pump is driven off the camshaft at one-half crankshaft speed. Oil is forced under pressure to all bearings by means of a high-pressure pump. This pump is located in the oil pan at the magneto end of the motor. It is a triple type driven by a vertical shaft through spiral gears off the crankshaft, and runs at crankshaft speed. The upper layer of this pump is the pressure pump which delivers oil under pressure to all the bearings. The center layer is a scavenge pump which returns all surplus oil at the propeller end of the motor to the reservoir. The lower layer is also a scavenge pump which returns all surplus oil at the magneto end of the motor to the oil reservoir. The oil reservoir is entirely separate from the crankcase, and can be made of any desired capacity; all surplus oil is strained and cooled thoroughly before returning to the reservoir. It is claimed that under no circumstances will the oil flood the cylinders, and that the oiling system is not affected by any angle of flying; also that the machine can completely capsize without flooding the cylinders. An instrument is provided and mounted in view of the pilot to show at all times the amount of oil in the reservoir. There is also a pressure gage mounted in front of the pilot indicating at all times the pressure in the oiling system.

The motor complete with electric starter and generator will weigh approximately 650 lbs.



Section of Howard aviation engine showing sliding rocker shaft for compression relief

FOR THE MEN WHO ARE TO GO OVERSEAS—V

HAVING received a number of requests from aviation instructors and students for French aeronautic literature and realizing that the students who will soon go to France should be familiar with the French aeronautic terms as popularly employed in descriptive literature—instead of merely giving a dictionary of terms; and realizing also the necessity of familiarizing them with the general features of the German machines which they will have to fight, AERIAL AGE sent to France for the very latest technical aeronautic literature and description of German machines.

The fifth instalment, given herewith, is part of a chapter of the work "L'Aviation Et La Guerre," edited for the Aero Club of France by Jean Lagorgette, the noted French aeronautic engineer.

Officer instructors have suggested that the best plan would be to print the French text without attempting to give the English translation of every word, as the first need is to supply the instructors with the necessary material, to enable them to read from the French and explain to the students while they take notes, which is the present practice in teaching all the other subjects.

AEROPLANE PARTS

(In French and English)

THE PLANE	L'AVION
Axle	Essieu
Barograph	Barographe
Biplane	Biplan
Blade (Propeller)	Pale-Helice
Body	Fuselage
Bolt	Boulon
Bracing Strut	Jambe de Force
Bracing Tube	Tirant
Bracing Wires	Croisillons
Bronze Bearing of Axle Guide	Patin de Glissiere
Cabin	Cabane
Cable	Cable
Cellule	Cellule
Central Panel	Plan Central
Cloth Winding	Marouflage
Cockpit	Carlingue
Compass	Boussole
Control Bridge	Commandes A Pont
Control Elements	Commandes
Control Stick	Manche A Balai
Cord Winding	Transfil
Cover	Housse
Cushion	Coussin
Dihedral	Diedre
Dope	Enduit
Elevator	Stabilisateur
Engine Bed	Berceau du Moteur
Engine Spider Support	Araignee Support de Moteur
Fair	Profil
Fairing	Fusele, Profile
Fastening	Attaches
Fin (Tail)	Derive (Plan)
Fittings	Ferrures, Godets
Flexible Shaft	Transmission Flexible
Flippers	Volets de Profondeur, Stabilisateur
Flooring	Plancher
Foot Lever	Palonnier
Frame	Chassis
Glass Gauge	Tube de Niveau
Handle	Poignee
Hinge	Charniere
Hollow Wood	Bois Creus
Hood	Capot
Hub	Moyeu
Joy Stick	Manche A Balai
Knuckle	Charniere
Laminated Wood	Contreplaque (Bois)
Landing Gear	Train D'Atterrissage
Leading Edge	Bord D'Attaque Aretier Avant
Linen	Toile
Longeron	Longeron
Longitudinal Bar	Longeron
Map Holder	Porte-Cartes
Monoplane	Monoplan
Nut	Ecrou
Padding	Bourrelet
Panel (Central)	Plan Central
Piano Wire	Corde A Piano
Pressure Pump	Pompe A Pression
Pressure Tank	Reservoir Sous Pression
Propeller	Helice
Propeller Flange	Flasque D'Helice
Pulley	Poulie
Rim	Jante
Rope	Corde
Rudder	Gouvernail
Rudder Bar	Palonnier
Runner	Patin, Patinnage
Safety Belt	Ceinture de Surete
Safety Wires	Frein de Surete
Screw	Helice
Seat	Siege
Shaft (Flexible)	Transmission Flexible
Shock Absorber	Extenseur
Side Panel	Panneau
Single Seater	Monoplace
Skid	Patin, Patinnage
Spokes	Rayons
Stabilizer	Plan Fixe de Queue
Stabilizing Fin	Plan de Derive
Steering Wheel	Volant
Strut	Mar, Montant
Tachometer	Compte Tours
Tail	Queue
Tail Fin	Plan de Derive
Tail Skid	Bequille
Tank	Reservoir
Thimble	Cosse
Three Seater	Triplace
Throttle	Manette
Tilting Wings	Ailerons
Tire	Pneu, Pneumatique
Tractor Screw	Helice Tractive
Trailing Edge	Aretier Arriere, Bord De Sortie
Triplane	Triplan
Tube	Tube
Turn Buckle	Tendeur
Turret	Tourelle
Two-Seater	Biplace
Varnish	Vernis
Wheel	Roue
Wind Shield	Pare Brise
Wing	Aile, Plan
Wing Covering	Entoilage
Wing Ribs	Nervures
Wing Span	Envergure
Wing Spar	Bras D'Aile
Wing Support	Attaches D'Ailes
Wire Stay	Tendeur

EQUIVALENTS

1 METER = 39.37 INCHES

Legal Equivalent Adopted by Act of Congress, July 28, 1866.

LENGTH

Centimeter	=	0.3937	inch
Meter	=	3.28	feet
Meter	=	1.094	yards
Kilometer	=	0.621	statute mile
Kilometer	=	0.5396	nautical mile
Inch	=	2.540	centimeters
Foot	=	0.305	meter
Yard	=	0.914	meter
Statute mile	=	1.61	kilometers
Nautical mile	=	1.853	kilometers

AREA

Sq. centimeter	=	0.155	sq. inch
Sq. meter	=	10.76	sq. feet
Sq. meter	=	1.196	sq. yards
Hectare	=	2.47	acres
Sq. kilometer	=	0.386	sq. mile
Sq. inch	=	6.45	sq. centimeters
Sq. foot	=	0.0929	sq. meter
Sq. yard	=	0.836	sq. meters
Acre	=	0.405	hectare
Sq. mile	=	2.59	sq. kilometers

VOLUME

Cu. centimeter	=	0.0610	cu. inch
Cu. meter	=	35.3	cu. feet
Cu. meter	=	1.308	cu. yards
Cu. inch	=	16.39	cu. centimeters
Cu. foot	=	0.0283	cu. meter
Cu. yard	=	0.765	cu. meter

CAPACITY

Milliliter	=	0.0338	U. S. liq. ounce
Milliliter	=	0.2705	U. S. apoth. dram
Liter	=	1.057	U. S. liq. quarts
Liter	=	0.2642	U. S. liq. gallons
Liter	=	0.908	U. S. dry quart
Dekaliter	=	1.135	U. S. pecks
Hectoliter	=	2.838	U. S. bushels
U. S. lik. ounce	=	29.57	milliliters
U. S. apoth. dram	=	3.70	milliliters
U. S. liq. quart	=	0.946	liter
U. S. dry quart	=	1.101	liters
U. S. liq. gallon	=	3.785	liters
U. S. peck	=	0.881	dekaliter
U. S. bushel	=	0.3524	hectoliter

WEIGHT

Gram	=	15.43	grains
Gram	=	0.772	U. S. apoth. scruple
Gram	=	0.2572	U. S. apoth. dram
Gram	=	0.0353	avoir. ounce
Gram	=	0.03215	troy ounce
Kilogram	=	2.205	avoir. pounds
Kilogram	=	2.679	troy pounds
Metric ton	=	0.984	gross or long ton
Metric ton	=	1.102	short or net tons
Grain	=	0.0648	grams
U. S. apoth. scruple	=	1.296	grams
U. S. apoth. dram	=	3.89	grams
Avoir. ounce	=	28.35	grams
Troy ounces	=	31.10	grams
Avoir. pound	=	0.4536	kilogram
Troy pound	=	0.373	kilogram
Gross or long ton	=	1.016	metric tons
Short or net ton	=	0.907	metric tons

Notes, Relatives aux Avions Allemands (Fifth Instalment)

Per JEAN LAGORGETTE

Le profil des ailes est assez courbe, assez concave, comme sur tous les avions allemands, même destinés à la vitesse, et d'ailleurs assez lourds par eux-mêmes.

Leur bord postérieur est rigide.

Les **GOUVERNAILS** (fig. 9 et 15) sont ceux des anciens Morane, sans plans fixes. Ici, contrairement à l'habitude, c'est le français (nouveaux Morane) qui a des plans de dérive, et l'allemand qui en manque. Cette absence est d'autant plus visible et laisse d'autant mieux voir l'amincissement du fuselage, que le gouvernail de l'Halberstadt est plus haut et plus pointu (étayé par deux tubes profilés), situé presque entièrement au-dessus du fuselage et ne mordant pas en dessous. Seule y existe la partie compensatrice supérieure. (La forme et la compensation du gouvernail de profondeur, sans stabilisateur fixe, sont identiques à celles des Morane).

Tous deux, les gouvernails sont construits entièrement en tubes. Les nervures (avec zig-zags au G. P.) sont brasées sur les pivots et les bords.

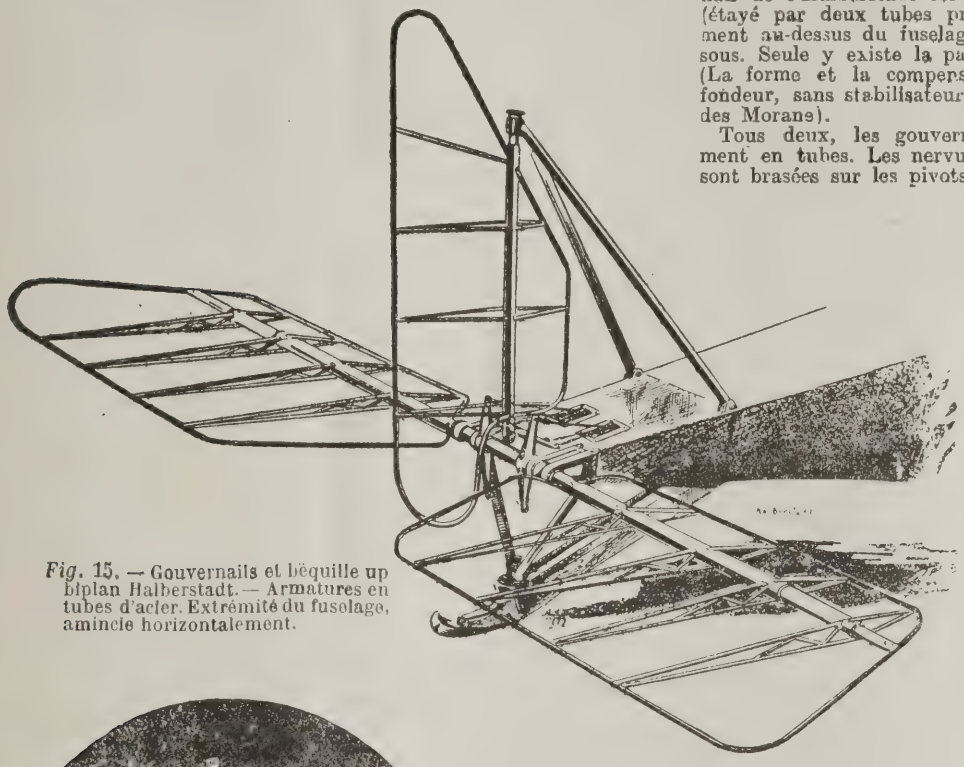


Fig. 15. — Gouvernails et béquille up biplan Halberstadt. — Armatures en tubes d'acier. Extrémité du fuselage, amincie horizontalement.

Le **FUSELAGE** est celui des anciens Morane : il s'amincit à l'arrière horizontalement jusqu'à former une arête horizontale et est de section rectangulaire.

Il est construit en bois. Ses 4 longerons, carrés, creux et marouflés en toile, sont assemblés aux montants et traverses sans être percés (fig. 16) par de simples équerres, légèrement embrassantes. Ces équerres sont fixées par des boulons, qui, avec les taquets de bois cloués en avant et en arrière des montants et traverses, maintiennent la solidité de l'ensemble et sa position transversale et longitudinale ; et elles portent des pattes auxquelles s'attachent les cordes à piano.

Le ventre est assez cintré d'avant en arrière, tandis que les deux longerons supérieurs sont en grande partie rectilignes.

Le dos est d'une forme bombée décroissante, qui s'arrête à mi-longueur. Il est soutenu par des cintres et des lattes (fig. 9).

Contrairement aux autres avions allemands, entièrement couverts de contreplaqué, la partie médiane du fuselage est entoilée. Pour éviter les coupures et frottements de la toile sur les croissillons, tendeurs, etc.., un intervalle est ménagé au moyen d une petite baguette clouée près de l'angle extérieur des longerons (v. fig. 16).

Le pilote est assis dans un siège contreplaqué, sur le réservoir d'essence (qui, sur d'autres biplans de chasse, est cylindrique et placé derrière le moteur).

Marchepied intérieur, sur le longeron inférieur, avec rabattant en aluminium et à ressort. Poignée pour faciliter l'escalade.

Le **TRAIN D'ATTERRISSAGE** est du type courant : 2 V en tubes profilés et réunis par un coude.

La jambe postérieure est fixée sous l'attache de longeron postérieur d'aile au fuselage. — Voie, 1 m. 90. Essieu de 48 mm. et 2 entretoises profilées.

La béquille, en frêne (analogue à celle de l'Albatros et du Fokker, qui ont 4 tubes) pivote sous un trépied en tube, auquel sa partie antérieure est attachée par un câble caoutchouté, tandis que sa partie postérieure est garantie par un sabot métallique.

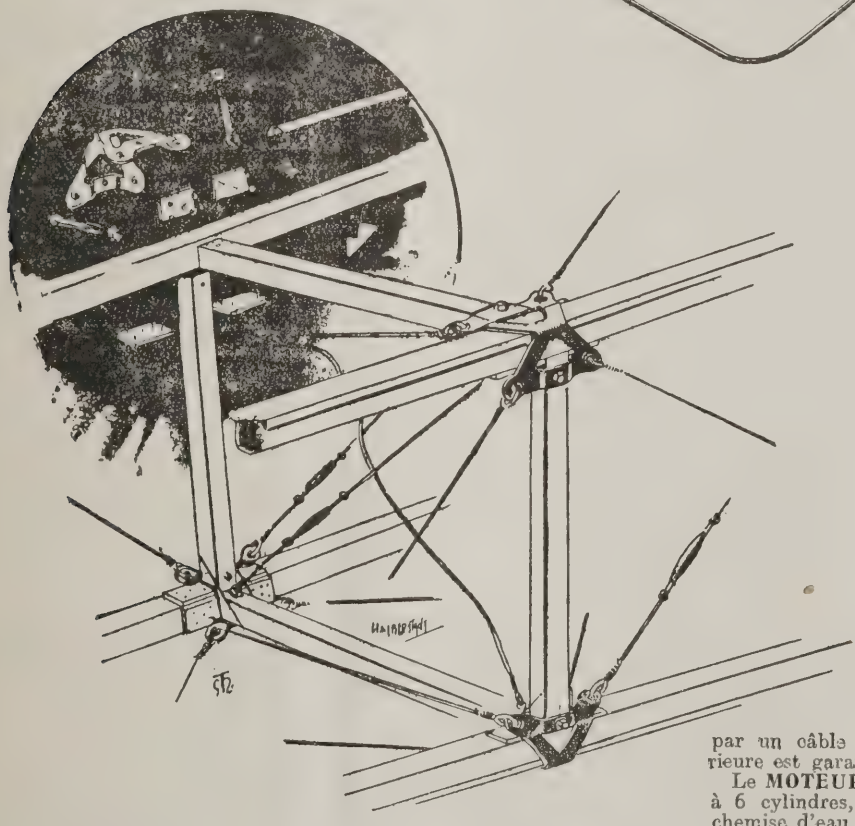


Fig. 16. — Fuselage d'Halberstadt. Assemblage par des équerres sans percement de longerons. A gauche, en bas, vue du côté intérieur et des taquets en place ; en haut, montants et traverses, prêts à être assemblés par les pièces détachées (sur fond noir) : équerre, 2 boulons, 4 taquets cloués, baguette.

Le **MOTEUR** est généralement un fixe Argus 120 H.P à 6 cylindres, verticaux, en ligne, accouplés par leur chemise d'eau (v. **Aérophile**, déc. 1916, p. 390).

Les soupapes sont situées au sommet des cylindres, en ligne, dans l'axe, et elles sont commandées, non par un arbre à cames comme sur les Mercédès, mais, comme sur les Benz, chacune par une tige verticale, située gauche.



MILITARY AEROSTATICS



COOPERATION BETWEEN BALLOONS AND ARTILLERY

By Major D. RAINSFORD HANNAY, Royal Flying Corps, British Army

(*Continued from page* 343)

When the battery sends "Gun fired," the chart room officer sets his stop-watch going and says, "Gun fired," to the observer, then, at the correct time: "10 seconds to burst"; "5 seconds to burst"; "4"; "3"; "2"; "1"; "Burst."

This relieves the observer in the balloon of watching with his glasses the whole time. He must keep his eyes fixed on the target, but need not strain them by peering through his glasses during the whole time of flight. When he hears "10 seconds" he gets ready, and at "5" puts them up.

As soon as he sees the burst the observer should make up his mind as quickly as possible what observation he will send down; first impressions are always best in balloon observations. This is sent down to the chart room officer, who passes it on to the battery. In practice it has been found best for all observations to be passed through the chart room. There is always an officer on duty there, and it is his job to help the observer, and also to check his observations and query any which seem ambiguous or erroneous.

Let us say the first observation is:

"First Shot—30 minutes left."

"Short" or "over" is not given, as, the shot being wide of the target, the observer cannot say for certain.

"Second Shot—20 minutes right and short of the small wood S. E. of the target."

"Third Shot—5 minutes left and over; apparently hit a house, large cloud of red brick dust."

"Fourth Shot—5 minutes right; struck house just to right of target."

"Fifth Shot—Line and short on the road."

"Sixth Shot—Unobserved, but smoke and dust rising 10 minutes right and over from centre of village."

"Unobserved" should always be sent if the actual burst is not seen. Batteries must expect to get a number of unobserved shots, and must not get impatient with an observer who sends down several of them, as it is just as likely to be the fault of the battery as that of the observer. Also, the battery will know they are working with an honest and truthful observer and not with an overconfident or nervous one; both of these types are capable of sending down anything, so long as it is something.

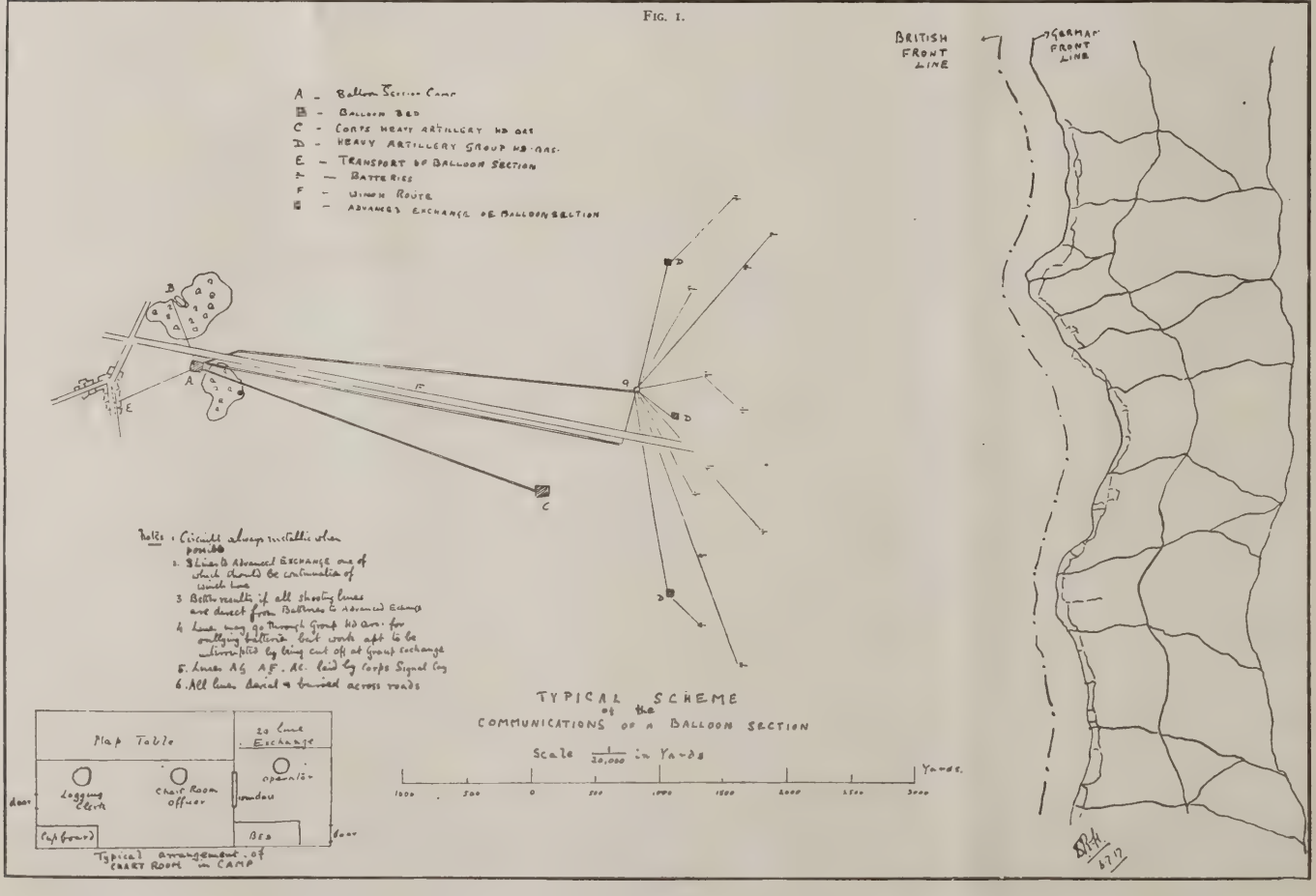
And so the shoot proceeds until the target is registered, when registration is taking place, or demolished if the battery is shooting for effect.

The above is a typical shoot on a normal and fixed target.

We will now discuss counter-battery work, which is perhaps the most important of the work allotted to balloon sections. To remove any possible doubt at the outset, a balloon cannot observe for a destructive shoot (that is to say, it cannot see the emplacements of a hostile battery); but what a balloon can and does do every day in France is to observe the flashes of hostile guns and note down as accurately as possible the map position, and, by ranging a battery on these flashes, to stop him firing. The procedure is as follows:

The observer sees the flashes of a hostile battery. As quickly and as accurately as possible he notes their map position. (Map reading from balloons is quite the most important part of a balloon observer's training.) This reading is sent down to the chart room officer, who will check it with the records showing the position of all hostile batteries which had been previously reported. He will, if necessary, check the position of the flashes in conversation with the observer. When satisfied, the chart room officer will get in touch with the counter-battery group headquarters and inform them about the flashes. A battery will be detailed to engage the hostile battery. The chart room officer will get in touch with this battery through the advanced exchange,

FIG. 1.



and, in a very short space of time, the hostile battery should be engaged and its activity stopped.

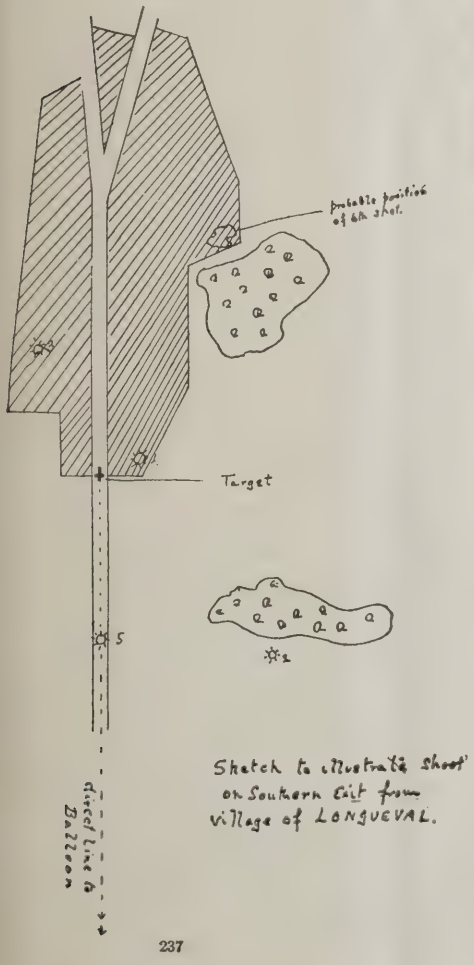
When reporting hostile flashes the observer will endeavor to locate the ground in our lines which is being shelled. This information should always be reported to the heavy artillery headquarters, as it helps in ascertaining the arcs of fire of the hostile batteries.

A balloon observer can observe for shrapnel by the following method:

When he sees the burst of the shell he first notes direction, say 30 minutes right of the target, and then the height of the burst above the line of sight balloon-target in a vertical plane; this enables the battery commander to correct his fuze as well as his range and deflection. It is obvious that nothing should be said about range when reporting an air burst. An observation for time shrapnel would be sent like this: "30 minutes left and air over 20 minutes." The height above the line of sight can be gauged by the vertical graticules in the binoculars.

The balloon section should coöperate as much as possible with the aeroplane squadron attached to the corps for artillery observation, and, whenever possible, the officer commanding the corps squadron and balloon section should meet the G. O. C. Corps Artillery the previous evening to arrange the work of the succeeding day. When active operations are taking place it is often possible to

FIG. 2.



have certain batteries placed at the direct call of the balloon, when the latter observes an active hostile battery, or a fleeting target such as transport, on the road. This method tends to greater speed and to a closer touch between batteries and observers. Balloon observers frequently visit the batteries with which they work, and it is a strict order that, if anything goes wrong during a shoot, or if the shoot is unsuccessful in any way, the observer must, as soon as he comes down, visit the battery and find out what has happened at the battery end and work things out with the battery commander so that no mistakes will happen the next time.

Artillery officers must realize that mist, wind, and the position of the sun all militate against good balloon observing, and they should not press the observer to "have a try," or, "Well, do your best," when he has once said that he cannot observe on the desired target.

Dead ground is also a handicap in balloon observation. Batteries should not ask balloons to observe on targets which, for instance, are situated just behind a large wood or at the bottom of a ravine. All balloon sections have maps prepared with all dead ground at the normal range and normal height shaded in, so batteries can always be previously informed if any particular target is invisible to the observer.

In conclusion, balloons have thoroughly proved their value in France and have relieved the aeroplanes of a great deal of artillery observation work. To get the best results artillery officers must appreciate both a balloon's powers and its limitations, and then by thorough coöperation much excellent work can be done.

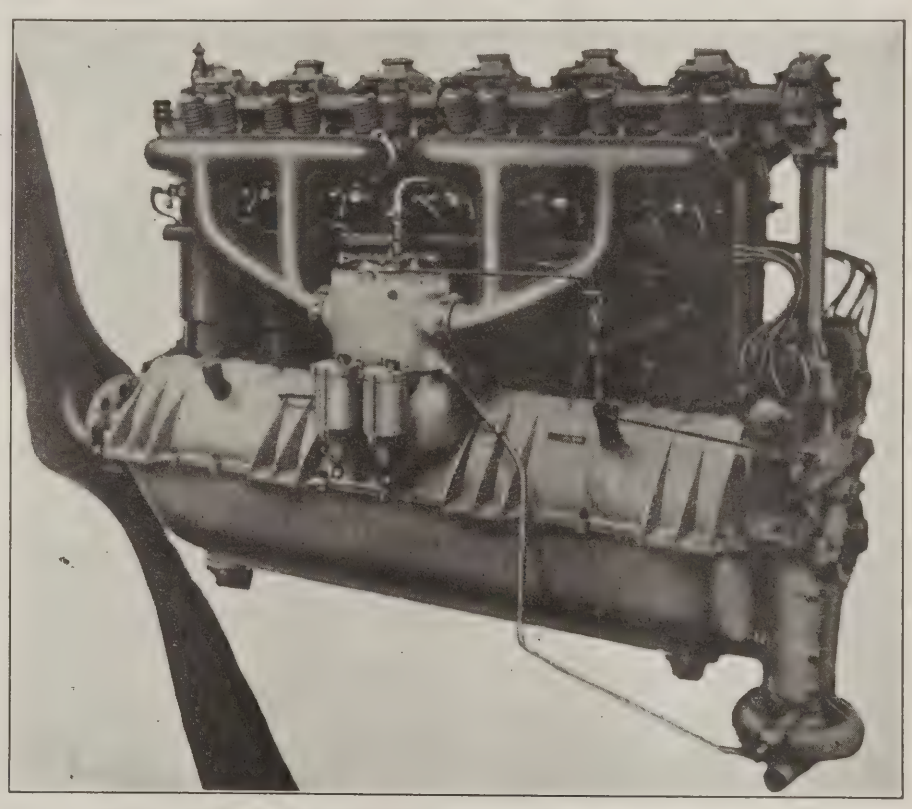
TURIN TO LONDON NON-STOP FLIGHT

Captain Laureati, of the Italian Air Service, who has just made the sensational non-stop flight of 700 miles from Turin, Italy, to London, is no novice at long-distance traveling by air. Only a few weeks ago he made a 1,000 mile journey from Turin to Naples and return to Turin in exactly 10 hours 30 minutes, despite a strong headwind and frequent showers of rain on the return trip. On both occasions Captain Laureati flew a Sia biplane fitted with a 300 h. p. Fiat engine. The entire machine may be considered a Fiat production, the Sia Company being a subsidiary of the Fiat Company, of Turin.

Although the flight from Turin to London, across the Alps, over the whole length of France and over the English Channel, appears the most sensational, Capt. Laureati considers that his previous trip from Turin to Naples and back was more difficult. On this occasion he covered 481 miles on the outward journey and 559 miles on the return trip, making a total of 1,040 miles in 10 hours 35 minutes flying time.

On the occasion of his Naples trip Capt. Laureati was alone in his machine. The total load carried was 1,500 pounds, of which 1,160 pounds represented fuel and 340 pounds the weight of the passenger, oil and provisions for the journey. Immediately after this flight had been accomplished, Captain Laureati decided that he would make a direct flight to London. He studied the route carefully by means of maps, but did not go over the country by road, and had never previously flown over France. As the distance was well within the range of the machine, a passenger was carried, in addition to arms, newspapers and mail. Before starting from Turin the pilot declared that he would accomplish the journey in seven hours; his estimate was very accurate, for he landed at Hounslow, in the suburbs of London, exactly 7½ hours after starting out. The half hour he lost on the way is explained by the fact that while over Mont Cenis, at a height of 12,000 feet, he encountered a storm with strong north-west wind.

The aeroplane used by Captain Laureati is a tractor biplane with a maximum horizontal speed of more than 100 miles an hour. The 300 h. p. Fiat motor is carried under a bonnet and behind the radiator. The engine is a standard type of Fiat of which several thousands have been delivered to the Allied governments, with six separate steel cylinders having welded-on sheet steel water jackets, and four inclined valves in the head, operated by a single overhead camshaft. A twin carbureter is employed, and there are two magnetos firing a pair of plugs in each cylinder. The propeller is direct mounted on the crankshaft and runs at a speed of 1,200 revolutions a minute. No better proof of the reliability and efficiency of the engine could be furnished than these two non-stop flights of 700 and 1,040 miles.



300 H.P. Fiat Motor used by Capt. Laureati in Flying from Turin to London

FOREIGN NEWS

BELGIUM

Many tons of bombs were dropped October 28 on German military establishments in Belgium by British aviators. The raids are described as follows in a statement from the Admiralty:

"The naval air service carried out bombing raids on enemy aerodromes at Engel and St. Denis Westrem. Many tons of bombs were dropped close to the sheds and the railway line. Our aviators also bombed the railway junctions at Cortemarck and Lichtervelde. About two tons of bombs were dropped.

"The enemy aerodrome at Varssenaere was bombed at noon on October 28. Direct hits on the sheds were made. During the same raid, bombs were dropped on the Stalhillbrugge station, near Bruges.

Nov. 1.—More than 200 bombs were dropped by British naval planes during the last forty-eight hours in the most extensive raid of its kind since the outbreak of the war. Unusual success was achieved.

Ostend, Zeebrugge, the Bruges docks, the St. Denis western aerodrome and many other military works of great importance to the Germans in Belgium were successfully attacked.

FRANCE

The night of October 29 German aeroplanes bombarded Dunkirk, Belfort and Calais. In the afternoon St. Die was likewise bombarded. Four German aeroplanes were brought down and twelve were compelled to land damaged.

October 27, 28 and 29 French bombing aeroplanes dropped 2,000 kilos of explosives on stations and depots at Lichtervelde and Gits, Belgium. In addition the railway stations at Maizieres-les-Metz, Longeville-les-Metz and Thionville were bombed with 7,000 kilos of projectiles. A great fire broke out in the Maizieres station.

Paris, Oct. 31.—A War Office official statement issued tonight says:

"Our bombing escadrilles last night dropped 7,700 kilos (about 7½ tons) of projectiles and explosives on the railway stations at Thionville, Bettembourg, Maizieres-les-Metz, Longeville-les-Metz, Josppy and Conflans, as well as on the station at Luxembourg.

"On October 30 six enemy aeroplanes were brought down by our pilots, four others fell in a damaged condition within their own lines.

"Enemy aviators threw down thirty bombs last night on Dunkirk.

French army headquarters reports that on November 1 two German aeroplanes were brought down by French fliers and one by anti-aircraft guns. Seven enemy machines were compelled to land.

Bombarding squadrons dropped bombs on the Mulheim station, aviation grounds at Beblestadt, munition depots at Ruffach Wepereimthal and the station at Thionville.

In reprisal for the bombardments of Dunkirk seventeen French aeroplanes dropped 5,500 pounds of projectiles on the town of Offenburg, in the Grand Duchy of Baden.

During the course of the battle of Malmaison, on November 2, French aviators fought 611 aerial engagements, brought down sixteen German aeroplanes and set three captive balloons on fire. In addition, fifty enemy aeroplanes fell inside their own lines.

With the American Army in France, Oct. 31.—For the last two days there has been considerable aerial observation. Late yesterday three German planes flew over the American trenches.

The relay shell and the bouncing bomb are the latest German inventions in frightfulness. They have just made their appearance on the western front and it is believed the Allies are already making preparations to follow suit and pay the Germans in their own kind.

The relay shell is about sixteen inches in diameter, and is fired from a naval type Skoda gun, with flat trajectory and high velocity. It is fitted with a contact instantaneous fuse, so that the bursting charge is detonated by five pound pressure on the nose of the projectile.

When the shell bursts it hurls forward about fifty small bombs, the size of hand grenades, which themselves fly good distances and explode at touch. The effect is much the same as with shrapnel, except that the bombs are a good deal more deadly, each one bursting into twelve to fifteen hundred parts and scattering bits of steel for a distance of many yards.

The bouncing bombs are dropped by German aviators. They are provided with a resilient base of leather, rubber and rope, which makes them go upward into the air after striking the ground. The special fuse attached causes the bomb to burst when it has reached the pinnacle of its bound, about six feet in the air.

In French towns behind the lines, which the Germans have raided and dropped bombs upon, there has been no mark on the ground indicating where the bomb landed, but death and destruction has been caused in a circle round the spot where the force of the explosion was felt.

The French authorities have found butts of the aerial bombs and all are provided with a rubber base—synthetic rubber being used—and the projectiles are wrapped round and round with rope, making them resilient.

By exploding in air the force of the bomb is not wasted in tearing a hole in the ground, but scatters its damage round about at a certain height from the earth. Inasmuch as the targets of the raiders are always buildings, the bouncing bombs achieve the maximum damage. The bombs are weighted so that the end with the rubber pad will strike the ground first. The impact with the earth sets in action the time fuse which detonates the bomb a fraction of a second later when the bomb has bounded into the air.

GERMANY

A German dispatch dated October 29 says that since October 22 the enemy has lost forty-eight aeroplanes in aerial engagements and by anti-aircraft guns. Three of these were brought down in home territory.

The stained glass windows of the Cologne Cathedral, according to German newspapers, are being taken out and replaced with plain glass as a precaution in case of air raids.

The Cologne Cathedral is one of the most magnificent Gothic edifices in the world. Some of its stained glass windows date from 1508, but most of them are modern. The older windows are among the finest examples of early sixteenth century art.

GREAT BRITAIN

Hostile aeroplanes tried to carry out a raid on the southeast counties of England on the night of October 29. None was able to pass the outer defences, according to an official communication.

Twelve British machines on October 30 attacked Pirmasens, twenty miles beyond Saarbrucken, Germany. Bombs were seen to burst on factories and gas works with excellent results. In the evening, British machines bombed the railway station and lines around Saarbrucken.

London, Oct. 31.—A lone enemy aeroplane made an unsuccessful raid on the Kentish coast at 4:30 o'clock this morning, according to official announcement today. When engaged by coast defense guns the plane immediately fled, dropping its bombs into the sea.

London, Nov. 1.—Eight persons were killed and twenty-one others were injured in the German air raid last night.

The text of Lord French's statement on casualties says:

"Latest police reports state that the total casualties caused in last night's air raid in all districts were:

"Killed, 8; injured, 21.

"The material damage was very slight and no injury was done to any naval, military, or munitions establishment.

"A large number of our own machines went up. All of them returned safely."

About thirty aeroplanes in seven groups took part in last night's air raid. Three of them penetrated to London.

There was heavy firing in the London area against the aircraft.

The weather was such that Londoners expected a visit from German aircraft. There was no wind and the moon was full, with slight clouds, which obscured it at times. The theaters had emptied and a majority of the night pleasure seekers were on their way home when the warning was given.

It was noticeable that fewer people took shelter in the tubes and other public places than on previous occasions.

ITALY

Rome, Nov. 4.—Udine and other towns in the invaded districts are being placarded with messages announcing the peaceful intentions of the Austro-German forces. Aeroplanes also dropped handbills along the Tagliamento offering peace, according to Deputy Girardini, who has just returned from the districts which he represents in Parliament. Last summer Austrian aeroplanes dropped poisoned candy in the region.

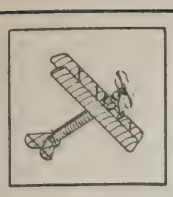
During the night of November 2-3 Italian aviators flew over the left bank of the Tagliamento and destroyed various ammunition depots not evacuated during the withdrawal. Yesterday two German aeroplanes were brought down at Odermo and Codroipo.

One lone Italian post on Monte Nero, cut off by the sweep of the Teutonic armies from the remainder of General Cadorna's forces, held out three long days against the invaders and then gave up only because the ammunition ran out.

During those three days, Italian aviators, circling over the position, dropped bread and other food for the courageous garrison.

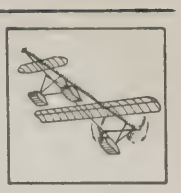


One of the Spad Scouts flown by Bennett C. Moulter, an American in the French Aviation Corps on the Belgian Front



MODEL NEWS

Edited by G. A. Cavanagh



THE MAN-CARRYING KITE

By SAMUEL F. PERKINS

THE Man-Carrying Kite is of no great value on land, as the wind does not blow day and night, day in and day out, but on the water with the kites towed by steamships their scope of usefulness is greatly enlarged. On the vessel making at least twelve miles per hour, required to make a definite course, the kites can be used practically under all conditions except when the direction of the wind is about forty-five degrees either side of dead astern and inside these points and has a velocity of approximately the same speed as the vessel. If there is fifteen miles difference between the speed of the vessel and the velocity of the wind, the kites can fly even with a stern wind; as for example velocity of wind thirty miles per hour approximately astern, and the speed of the vessel fifteen miles per hour. The kites can operate in approximately a twelve to fifteen mile wind, and in this instance kites would fly ahead of the vessel in a fifteen mile wind. The above conditions apply to the vessel that could not vary its course at all to favor the kites. If the vessel could alter its course or speed slightly when the wind was from the stern, the kites could be flown anytime, providing the vessel makes a speed of from twelve to fifteen miles per hour.

In order to describe it more fully we will compare it with the kite balloon, whose value is now recognized by the United States Navy. The Man-Carrying Kite will serve approximately the same purpose as the kite balloon. It has some advantages and some disadvantages. The most serious limitation of the Man-Carrying Kite is its impracticability in light winds. This is offset by the fact that in very high gales the kite balloon cannot stay up, while a Man-Carrying Kite made properly will outride any gale short of an actual hurricane. There is no question but what the Man-Carrying Kite will outride the kite balloon as far as wind is concerned anytime. It does not seem as if the Man-Carrying Kite's failure to fly in a light wind is as great a drawback as the kite balloon's inability to ride out heavy gales. When the Man-Carrying Kite fails because of lack of wind, the aeroplane can be easily substituted, whereas the aeroplane and kite balloon are both difficult to handle in heavy gales. *In a situation like this the Man-Carrying Kite is practically the only means of sending an observer into the air.*

The Man-Carrying Kite can be sent up from any vessel large or small, whereas the kite balloon and aeroplane require a ship of fair size and expensive equipment. This fact is particularly advantageous because all the smaller scouting destroyers of the Navy can be furnished with Man-Carrying Kites, and thus send up *their* observers as none of these vessels are large enough to carry either kite balloon or aeroplane. In handling the Man-Carrying Kite no experienced men are needed, as the regular crew of the vessel can send up the kites. Being of much simpler construction than either kite balloon or aeroplane the care required is slight in comparison; as in the kite balloon, the making of gas and guarding against leakage; and in the aeroplane, repairing engines and keeping gasoline supplied. The Man-Carrying Kite depends upon the wind and the speed of the vessel for its power. Man-Carrying Kites can be made in much less time and at far less expense than either kite balloons or aeroplanes. Furthermore, there is no expense of fitting vessels over for kites. Man-Carrying Kites can be stored in a box twelve feet long and eighteen inches square. They are easily stored and easily moved, not weighing but two hundred and fifty pounds, and can be set up and flown with observer in less than twenty minutes, with men who have done it a few times. No extra ropes are needed, only a dozen kites. All other rigging necessary is a part of the vessels equipment.

To a cruiser detailed to scout the ocean for commerce raiders, Man-Carrying Kites would be a very practical addition. She could keep her observer aloft twenty-four hours a day if so desired, at practically no expense whatever. This could be accomplished even when she had been away from her base for months. If using kite balloons for steady observation work her gas supplies would in time become exhausted, and the kite balloons worn out or lost. The Man-Carrying Kite could also be used to take a wireless aerial 1,000 feet high; in this way the cruiser could be in touch with the high-powered station at Washington at all times. This could hardly be done with the regular wireless masts in ordinary cruisers.

The Man-Carrying Kite could be used for lifting an observer on *every* vessel of the convoys now going to France. Each transport of the convoy as well as the screen of destroyers and cruisers could have its observer 1,000 feet in the air. Does it not seem as if the *"Antilles"* would have had a fighting chance to protect herself, and thus have saved the lives of seventy men, if she had had an observer 1,000 feet over her decks? This could have been possible if she had been fitted out with an oufit of Man-Carrying Kites.

It has been proven that Man-Carrying Kites will carry a marine observer hundreds of feet into the air. In February,



Samuel F. Perkins Suspended in Mid Air, Demonstrating the Sustaining Qualities of His Man-Carrying Kites.

1911, the writer was exhibiting his Man-Carrying Kites at the San Francisco Aero Meet. Rear Admiral Pond (then Captain) saw the kite tests. He enquired if an observer could be sent up over the water. The reply was that the writer had not tried it, but it seemed practicable. That night Rear Admiral Pond sent a wire to Secretary of the Navy Meyer who granted permission to sail from San Francisco to San Diego and make test flights while sailing down the Pacific Coast. During this trip Lieutenants Rogers and Charlton made flights from the kites for the Navy Department, and for the first time in history, American Naval Officers were sent by kites four hundred feet high, from the deck of the United States Cruiser Pennsylvania while under full steam at sea. At that time Rear Admiral Pond handed in a favorable report, but in view of the fact that no money was available, the matter of man-carrying kites for use in the Navy was left for future consideration.

Two people can be sent aloft if necessary on the Man-Carrying Kites as well as in the kite balloon and aeroplane.

In closing, the writer does not claim the Man-Carrying Kite is superior to the kite balloon or aeroplane. But he does claim it has its field, and has many good points; and among the most prominent of these is, great efficiency at low cost, when once it is known how to use it. There is no question but what high gales and heavy seas will interfere, if not totally prevent in some cases, the use of kite balloons and aeroplanes. These gales are just the time the kites fly at their best. It seems as if our Navy should investigate more fully the uses of kites for observation purposes, especially as they have been used to great advantage in foreign navies.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

Compensated

It was at one of the new Aviation Fields. A new recruit passed a second lieutenant, but failed to salute. The second lieutenant wheeled and said:

"You there, halt! Don't you know enough to salute an officer?"

The rookie gazed at him dumbly at a loss for a satisfactory explanation.

"Now, you stand there and salute me fifty times," ordered the lieutenant.

The rookie obeyed. A major, coming up, stopped to watch the performance to its completion. At this end, he said:

"What's this?"

The lieutenant explained.

"Don't you know that an officer must return the salute of a private?" inquired the major. "Return the fifty."

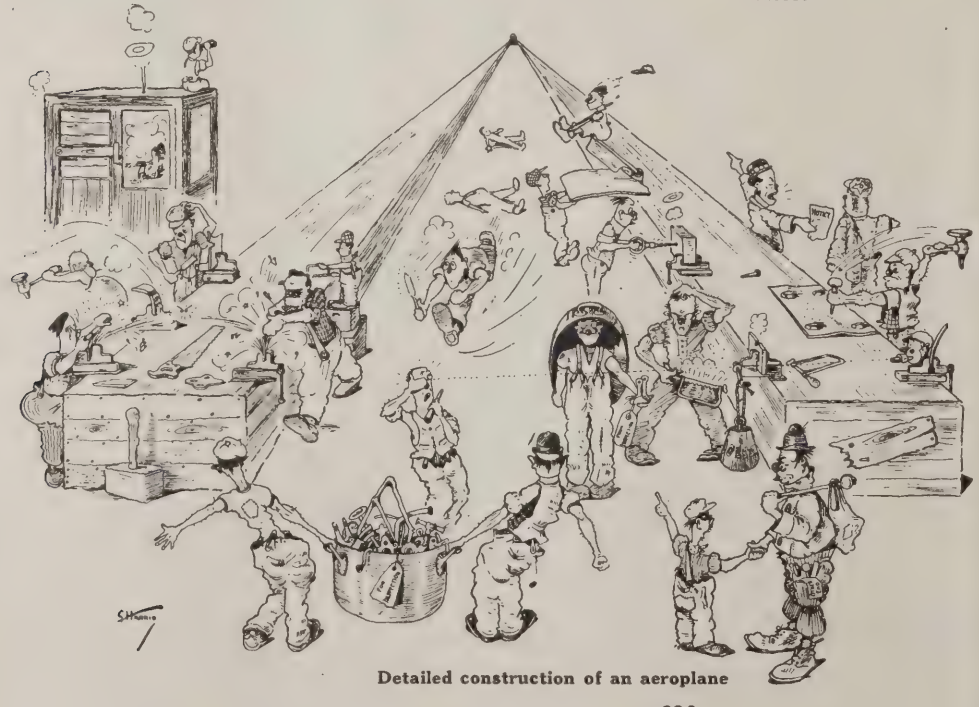
The second lieutenant did.—*Journal American Medical Association.*

It was necessary for one man to stand up and draw the enemy's fire. A soldier volunteered and fortunately not one of the bullets struck him. When the charge was over, the captain said to the brave fellow, "Where did you get the wonderful nerve to stand out there and make yourself a target for the bullets of the enemy?"

The other smiled.

"For five years," he answered, "I was a guide in the Maine woods."—*Boston Transcript.*

The Disappointed One—The officer comes up an' says, "Which one of you boys would like to have a night out of the trenches?" I steps forward, an' 'e says, smilin', "Well done, my boy, you will complete the wiring-party to-night."—*Sketch.*



Detailed construction of an aeroplane

Zeppleism

"I must have been in bed an hour when I was awakened by an awful crash," wrote the wife of a "Tommy" at the Front—the letter being quoted in the *Daily Dispatch.*

"I knew it was them Zepps. There was another terrible bang. I took my clothes off the chair, shoved them on a hook, gripped baby, and ran downstairs to the cellar. Dear ——, you must not blame me.

"It was horrible. I wondered why baby didn't cry. I looked at the dear. Dear ———, it was a good job he had a strong nightie on. I know you'll forgive me. If you only knew what I went through. I had hung baby upside down on the wall by the hem of his nightie, and was nursing the big pillow with lace frills. The poor kid. . . ."

Cheered Him Up

After much meditation the wealthy business man thought he would go a-flying. So he approached an aviator at a flying ground and fixed things up.

Up they went, but the machines seemed very unsteady. It wobbled and zigzagged terribly, and once or twice nearly sideslipped.

"Easy there!" gasped the passenger, roaring wildly above the noise of the engine. "Remember this is my first trip."

The aviator yelled back at him: "Well, it's only my third."

An Invitation

Please Mr. Editor:

I am just a helpless, little brain-child, sent into the big world to find a home. If you like me, adopt me; I feel sure I'll serve you well. If you don't, send me home; but please don't brand me with your office stencil, nor fold me other than you found me, nor stick pins into me; but let me go back home, please Mr. Editor, just as I came.

An Author's New-Born Brain-Child.

The invitation was accepted, and carried out to the letter. —Editor.

"Honey" Meant Aeroplane

A soldier who confessed to being from up-State, New York, sat down in a little cafe in the American zone and asked for honey to ease the deglutition of his war bread. He had always had honey at home, he explained to a comrade, who sat opposite, and he wanted it here. But the little waitress in wooden sabots and torn apron could not understand that strange word. The soldier scratched his head, and found an inspiration. He waved his hand slowly about his head: "Buzz, buzz, buzz," he said, thinking even a French girl must know that bees make honey.

"Ah, oui, oui" said the waitress, her face lighting up, "aeroplane."

"No aeroplane," said the up-Stater indignantly; "here, I'll show you," and on a slip of paper he drew his conception of a bee.

"Ah, oui, oui," again said the waitress after scanning the drawing; "j'ai dit, aeroplane."

The soldier gave up.

(*Continued from page* 378)

For control gear cables the following general types are used:

CABLE	Diameter in 1/1000	Breaking load in #	Weight in # 100"
5 strands, 3 wires	59.1	441	0.0080
7 strands, 3 wires	78.7	507	0.0091
7 strands, 5 wires	98.4	838	0.0148
7 strands, 1x6 wires	118.1	1,190	0.0235

Turn buckles, screws and bolts must undergo a cold-bending test to an angle of 45° and back to 180° without developing cracks.

Steel tubing (see fig. 73 for section) must be of uniform thickness, homogeneous in structure, and must not show any cracks. Soft steel tubing may be welded or hard soldered. Special steel tubing must be soft soldered; cracks near point must be avoided.

Generally, steel sheets are pressed. The welded parts must be subjected to compressive stresses only. In welding attention must be given to avoid blow holes and oxidation. Soft or medium soft steel may be welded. Welding must not be resorted to for hard or very hard steel.

We will devote here a few but important words on metallic wing and rudder framing. Some manufacturers are still using wood for this purpose; but the majority employ steel tubing (about 0,0236" thick), welded together. This gives us a solid, light, and rigid frame, simple in construction and easy to repair.

One last word on chrome-steel sheets which are now being used in aeronautical construction, for protective shielding purposes. These are made in thicknesses varying from 0.0591" to 0.1181".

Aluminum—There are some alloys of aluminum light in weight but having much higher resistance. One of these is "Duraluminum." The density of this alloy varies from 2,78 to 2.83, or slightly higher than that of aluminum. Its resistance, elongation, hardness and rigidity are the same as for soft steel. The normal alloy gives the following characteristic:

Elastic limit .....28,450 #/sq.in. to 35,500 #/sq.in.
Ultimate strength .....49,700 #/sq.in. to 56,800 #/sq.in.
Elongation .....15% to 20%

For the hardened alloys we have:

Elastic limit .....49,700 #/sq.in to 56,800 #/sq.in.
Ultimate resistance .....56,800 #/sq.in. to 78,100 #/sq.in.
Elongation .....2% to 10%

Duraluminum can be forged, welded, pressed, drawn, and threaded. It is used considerably in dirigible construction, but has not been introduced in aeroplane construction as yet.

Copper—Copper is used for tanks and is manufactured in sheets 0.0275" thick; sometimes 0.0197 inches. The gasoline and oil pipes are also made of copper. The density of copper is 8.9, the ultimate resistance is 34,200 #/sq. in., the elongation 30 to 40%. The ordinary brass (containing 64% copper, 33% zinc, 2% lead and 1% tin) and a density of 8.4, ultimate resistance is 22,800 #/sq.in., elongation 75%.

(*Continued from page* 381)

mixtures; or they may combine chemically to form quite different compounds of still harder consistency. It depends on the percentages of the respective metals whether the alloys are good or bad.

The various components of chrome steel consist of very minute grains of cementite, martensite, and austenite, distributed among one another. The quality of the metal varies according to the exact distribution and smallness of these items. If too much chromium were to be introduced, the brittleness inherent in the metal would assert itself, on account of there not being enough iron and carbon to combine with it to form cementite. It would partly crystallise, and the grains of chromium would readily break. If flinty road grit, or similar refractory material, gets among the balls of a bearing, the particles will slowly scrape and score their surfaces, and, of course, open the way to complete breakdown. When once the disintegration begins it may proceed apace by the dislodgment of particles of the metal itself. Deeper become the little grooves, as they are ploughed by the free grains, and corresponding ridges between them appear. The ridges then split across irregularly, and more particles are furnished for the continuance of the destructive action. Serious fracture suddenly follows, especially if loads are rather heavy.

Although friction is, of course, marvellously low when balls are perfect, the rugosities caused in the way described induce friction and heating, and these hasten the breaking down of their internal structure. The very fact that chrome steel is so exceptionally hard causes damage to the balls when parts happen to be accidentally scraped. Almost invisible specks of metallic dust rub between the meeting surfaces of the balls, and when once the mischief is started the remaining elevations abrade hollows in the opposing metals, and the lot act like miniature cogs, the ball going round and round in one direction, with slightly shifting allowances, as though it travelled on a pivot. As the diameter is decreased the ball works loose, still, however, being restricted to certain motions, until the depth of the fissures is so serious that the bulk of the ball divides. Jolting over stones, and sudden shocks, contribute to the wearing off process. Observations have been made on a small ball removed from a car bearing. About one-third of the surface is covered with concentric crevices of a crude nature. This part is well marked off from the polished area, which is quite undamaged, as shown in Fig. 1. The fine lines denote minute scratches. Grit, by widening these, exposes the under grains, which are gradually chipped out until a series of ring-like hollows and ridges, as shown in Fig. 2, are formed round the ball. These are afterwards broken up so much that holes and larger fissures result, as in Fig. 3, and when this has gone on for some time, the ball becomes not only useless itself, but dangerous to the whole vehicle.

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Dynamic Balancing Machine
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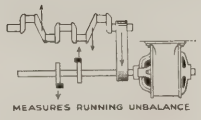
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We gladly demonstrate.

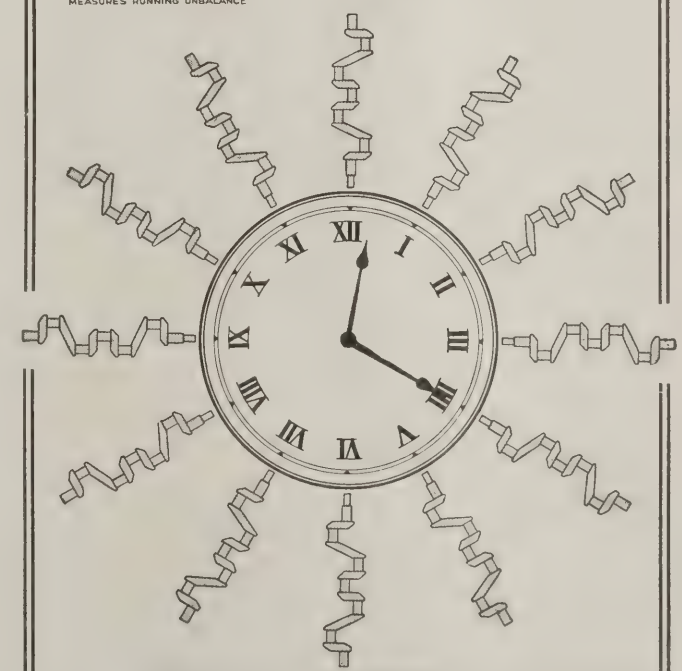
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AERIAL AGE WEEKLY

Vol. 6, No. 10 NOVEMBER 19, 1917 10 CENTS A COPY



A British Naval Scouting Airship Used to Convoy Ships. (Official Photograph.)

Billion Dollar "Emergency Air Fleet" Urged at Aero Club Annual Meeting

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BILLION DOLLAR "EMERGENCY AIR FLEET" URGED AT AERO CLUB ANNUAL MEETING

A BILLION dollar "Emergency Air Fleet" was one of the most important things urged by resolution at the annual meeting of the Aero Club of America, held at the Club House, 297 Madison Avenue, on November 12.

This resolution read as follows:

WHEREAS, the greatest difficulty of the Allies has been to move their forces fast enough to meet unexpected German attacks on weak points of the Allies' lines, and to overcome the advantage which the Germans have of being able to transport large bodies of troops, ammunition and supplies from one part to another by interior lines; and

WHEREAS, it is evident that powerful warplanes afford the needed combination of power and mobility in a higher degree than do any other appliances, and that the recent occupation of the Baltic Islands by Germans and the Italian reverses in the province of Venezia could have been prevented if the Allies had been able to send a sufficient number of torpedoplanes and bomb-dropping aeroplanes to assist the Russians and Italians at the first evidence of danger; and

WHEREAS, it is generally accepted by the recognized authorities on aeronautics that aeroplanes can easily be built which can fly across the Atlantic, and thereby solve the problem of delivering large units of aeronautic power to England, France, Italy and Russia, without dependence on ocean transportation, or interfering with it; and

WHEREAS, there are in the United States unutilized manufacturing facilities and resources which could build thousands of powerful warplanes during the coming year, without interfering with the present aeronautical programs of the Army and Navy; and

WHEREAS, with these warplanes there can conduct major aerial operations against the German fleet and U-boat bases, as well as against the German lines of communication and military industries and forces;

BE IT RESOLVED, that these facts be brought to the attention of the President, the Council of National Defense, the Secretary of War, the Secretary of the Navy, the Aircraft Production Board, and to the American public, through the press and that the coming Congress be urged to expand the present aeronautic program by appropriating not less than $1,000,000,000 for building an "Emergency Air Fleet," of huge warplanes; and also another $1,000,000,000 to carry out a comprehensive aeronautic program of training aviators and building the tens of thousands of fighting, photography, artillery, and contact patrol aeroplanes; dirigibles and balloons, which are needed to assure the Allies' supremacy in the air.

Creation of Allied Air Board Urged

Another important resolution adopted at the meeting urges the creation of an Allied Air Board, to coordinate the aeronautic efforts and resources of the Allied countries.

Separate Department of Aeronautics Urged for United States

The resolution which was adopted at the last annual meeting of the Club, urging the establishment of a Department of Aeronautics separate from and independent of both the Army and the Navy, its head a member of the President's Cabinet, and in full and undivided control of aeronautics was again adopted. It was brought out that Great Britain is creating an Imperial Air Service, independent of both the Army and the Navy.

Other Important Resolutions

(1) A resolution expressing to President Wilson the appreciation of the Aero Club of America and its constituent Aero Clubs, of his continuous personal interest and support of the aeronautic movement.

(2) A resolution of appreciation of the energetic work of the Council of National Defense, the Aircraft Production Board and the Signal Corps of the U. S. Army in creating and putting into effect the vast and efficient system of training of military aviators and producing the Liberty Motor, and to the International Standardization Board for the very valuable work it has done in the short space of time since it was created.

(3) A resolution of appreciation of the practical patriotism of the thousands of men who have volunteered and joined the Army and Navy Air Services.

(4) A resolution expressing the Aero Club of America's appreciation and gratification to the officials of the Coast Guard and Post Office for their efforts to employ aeroplanes to extend the efficiency of their departments, and offering the support of the Aero Club of America and constituent Clubs in every way in which they can assist.

(5) A resolution of appreciation to the members of the aeronautic industry throughout the United States for the patriotic attitude shown by them through the past years, when, though unsupported and not encouraged by the Government, they maintained the industry and provided the country with sources of supply of aeronautic equipment for national defense.

(6) The last Congress authorized the employment of aeroplanes in the Coast Guard, for the purpose of saving life and property along the coasts of the United States and at sea contiguous thereto and to assist in the national defense. But the necessary appropriations were not made available for carrying this plan into effect. It is urged that the appropriations be allowed as soon as Congress meets, so that this good work may proceed without delay.

(7) A resolution thanking the officers, the Board of Governors and the Chairman of the various committees of the Club and the officers of the affiliated organizations for the excellent work they have done during the past year.

(8) A resolution thanking the Aviation Section of the National Special Aid Society for their practical patriotism and energetic work in supplying American military and naval aviators in the United States and abroad with blankets, sweaters, socks, gloves, and other things needed to improve their welfare.

(9) A resolution thanking Messrs. Alan R. Hawley, Congressman Murray Hulbert, Henry Woodhouse, Rear Admiral Fiske, Godfrey L. Cabot, Augustus Post, Henry A. Wise Wood, Howard E. Coffin, Rear Admiral Robert E. Peary, Lieut. Col. Raynal C. Bolling, and F. G. Diffin for their good work in convincing Congress of the need of increasing

the aeronautical appropriations to $640,000,000; and for their untiring efforts in fostering the development of aeronautics in the Army and Navy and civilian aeronautic resources and the aeronautic industry of the United States.

The following Officers and Governors were unanimously elected: President, Alan R. Hawley; First Vice-President, Henry A. Wise Wood; Second Vice-President, Lieutenant Godfrey L. Cabot, U. S. N. R. F.; Third Vice-President, Rear Admiral Bradley A. Fiske, U. S. N.; Fourth Vice-President, Chas. Jerome Edwards.

Governors, Class A, Term Expiring 1921—Cortlandt F. Bishop; Alan R. Hawley; Captain James E. Miller, S. O. R. C.; Henry A. Wise Wood.

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Lord Northcliffe Elected Honorary Member

Lord Northcliffe was unanimously elected honorary member of the Club. Important reports of the works of the Committees of the Club and expressions from authorities praising the Club for its most valuable work were read.

UNITED STATES TO BUILD 75,000 AEROPLANES

THE magnitude of the aviation programme upon which the United States will embark on the completion of the present authorized construction about July 1 is to be determined shortly in a series of conferences among the aeronautic experts of the allied nations, according to a despatch in the *New York Sun*.

Because of the rapidly increasing importance of aeroplanes in military operations and the growing conviction among military officials that a preponderating supremacy in the air will bring victory to the allied arms it is the belief here that in the last six months of 1918 the United States will manufacture at least twice as many aeroplanes and motors as will have been manufactured in all the time from the entrance of the United States into the war up to July 1, 1918, a period of about fifteen months.

Reduced to figures this means that in the last half of 1918 American factories will turn out approximately 50,000 aeroplanes and 100,000 motors. Included in the estimate of the output involved in the present programme the United States will have manufactured for war purposes about 75,000 aeroplanes and 150,000 motors by the end of 1918.

Although this programme has not been definitely settled upon and will not be until the aviation heads of the allied Governments give it their approval within the next few weeks, the present military policy of the Allies will require a vastly increased production, which American officials say probably will put upon this country the task of doubling its first programme and completing it within approximately six months.

At the conference soon to be held there will be established among the Allies a complete coordination in the manufacture of aeroplanes, motors and accessories such as that which is taking place in every other line of military endeavor. The forte of the United States will be the quantity production of the Standard Liberty motor and the British type of biplane in which it will be installed.

Next to that the industries of this country will manufacture in quantity parts and accessories for American machines and for the machines of the Allies. The factories in this country undoubtedly will center their efforts on the manufacture of speedy combat machines largely to the highly developed plants in France and England. This Government, however, will not neglect the speedier type. Manufacturers here will follow all the developments and improvements in this type of machine and will produce enough to keep abreast of the progress made.

It is the prediction that next summer will see aerial warfare developed to proportions hitherto undreamed of. With the acquisition of the great fleet of aircraft the United States will be able to send over by that time the Allies will attempt an invasion of Germany by the air route with squadrons of combat machines and the heavier but more destructive bombing planes.

AVIATORS AND AVIATION OF THE FUTURE

By HENRY WOODHOUSE in *Motor Boating*

RECENTLY the Aero Club of America announced that steps were being taken to form an International Commission on Civil Aeronautics, which is to study the possible application of aircraft for commercial purposes and to outline plans for the employment of thousands of military aeroplanes and aviators after the war.

Immediately from every part of the country young men who are training as military aviators inquired eagerly for additional information.

"This means a whole lot to me—I'll be able to stay in aeronautics," was the sentiment expressed in each case.

"I couldn't go back to the slow grind," was the way others expressed it.

"I'd sooner drive an aero mail bus and fly than to go back to the bank and have my car with the chauffeur and my yacht and all that," said a wealthy young banker.

Life seems slow in many ways after one has been in the aeronautic movement and the thousands of American young men who are training in the United States, Canada, England, France and Italy can be counted on to continue their connection with the aeronautic movement in conducting and operating aerial lines for sport.

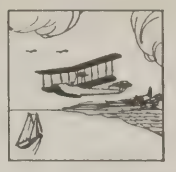
That there will be work for all of them there is little doubt. A preliminary plan of air routes which the U. S. Post Office would like to establish to save time in delivering mail to certain points far to reach by rail, boat or automobile, shows about 200 air lines. Supposing it takes only an average of eight aviators for each line, there will be employment for 1,600 aviators, without counting the administrative personnel to operate the air lines.

The Atlantic will be crossed before many months have gone by. It is the one obstacle in the way of delivering the tens of thousands of aeroplanes needed to strike Germany through the air, therefore it will have to be done. Now that the authorities are turning to it the general opinion is that the flight is really feasible and that with the improvements that will follow the first flight, crossing the Atlantic by air will be comparatively easy.

If the war lasts one year after the first trans-Atlantic flight has been made there will be delivered at least ten thousand warplanes by air, and several thousand young men will thus become trans-Atlantic air pilots. When the war is over they will be the pilots of the "Aerial express" that will leave hourly for different parts of the globe with mail and express matter. It will mean a whole lot to firms to have mail and express matter delivered across the Atlantic thirty or forty hours after mailing it—and while for a time they will send everything in duplicate, one by aeroplane and one by steamer, just as they now send in duplicate by two steamers, to meet a possible loss through U-boat warfare, they will be glad to avail themselves of the air lines. And there will be as many passenger-carrying lines as there will be mail-carrying lines; and there will be private air wagons of business firms, and thousands of machines used for scientific purposes, surveying, map making, exploring, coast guard and life saving service, railroad inspecting, etc. And, of course, there will be thousands of machines used for sport and pleasure.



The News of the Week



M. & A. M. Sanctions Aero Show

New York.—The aero show was sanctioned by the Motor & Accessory Manufacturers, Inc., on November 8.

The M. A. M. membership is going into the aero show—the Second International Pan-American Aeronautic Exposition, February 16-23—about four times as strongly as it did a year ago.

The association has taken practically all of the second floor of Grand Central Palace, this city, and as much of the third floor as it needs.

Wright Experimenting on Small Plane

Dayton, Nov. 8—Orville Wright is now conducting extensive experiments on a low-powered aeroplane for practical use after the war. It is his desire to provide a plane that bears the same relation to flight as does the Ford car to travel on the ground. It is hoped to increase the efficiency of the wing surface and to provide inherent stability to such an extent that with a 100-hp. engine the machine will require but a small place for landing or starting.

Thompson to Assist Deeds

New York.—Colonel W. Thompson has been detailed to assist Colonel E. A. Deeds in administering the work of the Aviation Section of the Signal Corps during the absence of Colonel Sidney Waldon, who is detailed to foreign duty. Thompson has been on the Contract Committee and in charge of purchases.

Jan. 10 and Feb. 1 Big S. A. E. Days

New York.—A comprehensive program for the Winter meeting of the Society of Automotive Engineers has been announced by the Meetings Committee. The program will center around two important S. A. E. days, one during New York show week, the other during Chicago show week. Thursday, Jan. 10, will be S. A. E. day at the New York show. Friday, Feb. 1, will be S. A. E. day at Chicago automobile show.

The Chicago war dinner promises to be perhaps the greatest dinner ever held by the society. It will be a $3 dinner and will come at the close of a day given over entirely to a professional session on farm tractors. The accommodation is for 1900 diners in one room. New York has been designated for the Automotive dinner, which will be held at the Hotel Biltmore. Jan. 10.

Gasoline Supply Is Ample

Washington.—The gasoline situation continues very favorable, according to latest reports from the Bureau of Mines, and the production of crude oil is such as not to warrant any fear on the part of the automotive industries for any shortage of fuel. There was a greater movement of crude oil from field sources during September than there was during August. During August there was a total movement of 21,299,089 barrels of 42 gal. per barrel, and during September this movement increased to 21,412,260 barrels. The greatest increase was in the Kansas-Oklahoma fields. There was also an increase in shipment from the gulf coast oil fields and also from the Rocky Mountain fields. The fields that showed a decrease in crude oil movement were Illinois, Texas in the north and central parts, Lima-Indiana and the Appalachian fields.

Japanese Fiscal Agents to Retain Control of Standard Aircraft Corporation

As stated in the last number of Aerial Age Mitsui & Co., Ltd., the Japanese fiscal agents who own the Standard Aircraft Corporation, are going to put part of the stock of that organization on the market. It is asserted that Mitsui & Co., Ltd., are going to retain ownership through holding stock control and their interests will be looked after by Harry Bowers Mingle, for many years counsel of Mitsui & Co. and at present general counsel.

No statement has been issued regarding the suit brought against Mitsui & Co., Ltd., by John E. Sloane. The details of this suit, as given by the New York *Times* are as follows:

"A suit of John Eyre Sloane, an inventor of aeroplanes, who married Miss Madeline Edison, daughter of Thomas A. Edison, against the Mitsui Company, a Japanese commission firm, for an injunction and an accounting, was revealed in the Supreme Court yesterday, when Konosuke Seko of 150 West Seventy-ninth Street, general manager of the Mitsui Company, was examined in Sloane's behalf.

"Sloane also names as defendants the Sloane Manufacturing Company and Shunzo Takaki, assistant manager of the Mitsui Company. The Sloane Company is a New Jersey corporation which manufactures aeroplanes at Plainfield and has 50,000 shares of stock valued at $10 each. Sloane held 26,500 shares of the stock. He alleges that he agreed to borrow $30,000 from the Mitsui Company through Takaki to finance the manufacture of aeroplanes for the Russian Government, giving his stock as security, and that it was agreed his shares were to be returned as soon as the loan from the Mitsui Company had been repaid from the profits. Without his authority, and in violation of the agreement, he also alleges Takaki in May, 1916, transferred his stock to the Standard Aero Corporation in which the defendants are interested.

"Sloane charges that after the majority stock in the company had been transferred the defendants 'stripped the Sloane Manufacturing Company of its asset and highly profitable business,' and the Standard Aero Company took over the business. He wants the defendants enjoined from carrying out their purposes and demands that they account.

"Seko, manager of the Mitsui Company, examined by Milton Mayer for the plaintiff, testified that his company had some dealings with Thomas A. Edison, as the result of which the loan to Mr. Edison's son-in-law was made. Sloane found himself unable to get the financial aid he expected from his relatives, Seko said, and finally adjusted the matter by turning over the stock in payment."

Aviator Acquitted by Court-Martial

At headquarters of the Department of the East, United States army, on Governor's Island, Lieut. John G. Livingston, retired, assistant judge-advocate of the general court-martial, has made public the findings of the recent court-martial in the case of Private Samuel O. Livingood, of the aviation camp at Princeton, N. J. Livingood was tried on two counts, one of which was that he had poison in his possession with intent to do harm to his comrades. The other, a technical charge, that he had the poison unknown to his commanding officer.

Livingood has been completely acquitted of the first and serious charge. On the second count he was given a small fine. He was sent back to Princeton to continue his aviation studies, and it was stated that the result of the court-martial in no way affected Livingood's standing as a soldier.

Draw on 47 Trades for Big Air Fleet

Washington.—An army of skilled workers from approximately forty-seven different trades is being mobilized by the aviation section of the Signal Corps for service in France in connection with the great air drive to be made by American fliers. The men will be employed as close to the fighting lines as airdromes can be built, and the great part of their work will consist in keeping every battle plane ready for safe and instantaneous service, in tuning engines for duty four and five miles in the air and in seeing that each plane and its parts are mechanically perfect. About two-thirds of the men will be made non-commissioned officers and each will be detailed to the class of work for which he is best qualified.

Sailmakers are wanted, as well as cobblers and tailors for making, stretching and repairing wings, cabinetmakers and boatmakers for woodwork about the fusillage, riggers to assemble planes and look after the wiring, and coppersmiths to see that there are no leaky gasolene tanks.

In addition to these the service wants armorers and machine gun repair men, instrument repair men, vulcanizers, gas works employees, rope riggers, cordage workers, automobile mechanicians, repair men, testers, blacksmiths, toolmakers, welders, moulders, electricians, draughtsmen, carpenters, fitters, plumbers, chauffers, motor cyclists, office clerks, stenographers, radio operators and photographers.

The service requires men who are physically fit, white and not more than 40 years old.

Kettering Nominated S. A. E. President

New York.—The nominating committee of the Society of Automotive Engineers has handed in the nominations for 1918 for the elective officers next falling vacant under the constitution, as follows:

For president, to serve 1 year, C. F. Kettering, vice-president of the Dayton Engineering Laboratories Co.

For first vice-president, to serve 1 year, David Beecroft.

For second vice-president, representing motor car engineering, to serve for 1 year, C. C. Hinkley, president and general manager of the Hinkley Motors Corp., for second vice-president, representing aviation engineering, to serve for 1 year; G. H. Houston, consulting engineer, New York.

For second vice-president, representing tractor engineering, to serve 1 year, Fred Glover, vice-president, Emerson-Brantingham Co.

For second vice-president, representing marine engineering, to serve for 1 year, H. R. Sutphen, vice-president, Elco Co., Electric Dynamic Co. and Submarine Boat Corp.

For second vice-president, representing stationary internal-combustion engineering, to serve for 1 year, H. R. Brate, of the National Gas Engine Assn.

For members of the Council, to serve for 2 years, Charles S. Crawford, associate engineer, Premier Motor Corp.; Charles M. Manly, vice-president and chief engineer of the Curtiss Aeroplane Co.; and J. V. Whitbeck, chief engineer, Chandler Motor Car Co.

For treasurer, to serve for 1 year, Charles B. Whittelsey, vice-president and factory manager, Hartford Rubber Works Co.

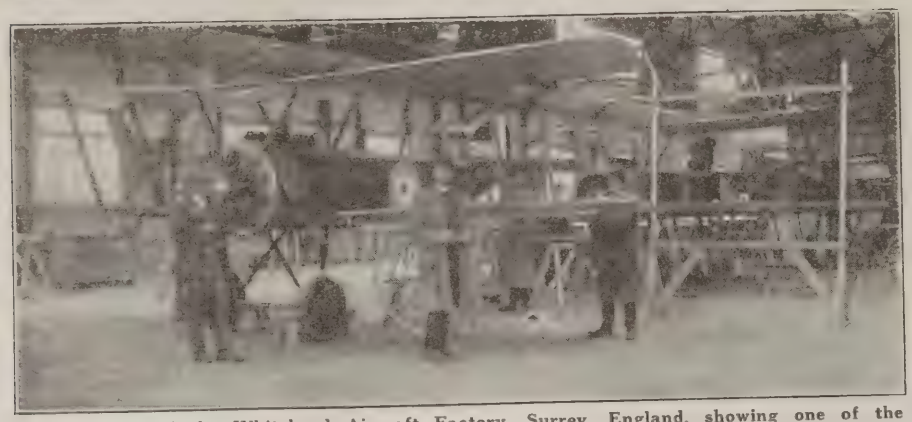
Tablet to Guynemer Placed in Pantheon

Paris.—To perpetuate the memory of George Guynemer, the greatest of French aviators, it is proposed that a tablet be placed in the Pantheon, where are the tombs and monuments of the national heroes of France. The project has been submitted to the French Chamber.

A request has also been sent to the Aero Club of France to open a subscription for the erection of a public monument to Guynemer.



Major A. L. Sneed, Commandant, U. S. A. Military School of Aeronautics, at the Massachusetts Institute of Technology. He is a native of Arkansas and was graduated from West Point in 1908



Interior view of the Whitehead Aircraft Factory, Surrey, England, showing one of the Sopwith Machines

Bispham Killed in Flying

London.—The inquest into the death of Lieut. David Bispham, son of the famous American actor of the same name, showed that he was making his second aeroplane flight alone when he was killed. The young American had been in the Royal Flying Corps about seven months and had won much praise for his skill. His machine crashed to earth while he was on a practice flight at Hendon Plains.

Change of Name

The Schweizer and West Manufacturing Company, 308 No. Ada Street, Chicago, Illinois, which up to the present has been supplying the industry with propellers has been succeeded by the West Woodworking Company, located at the same address. However, no change has taken place with regard to the management of the concern, the company will continue to maintain the same spirit of coöperation.

Aviators Win at Football

Football was revived recently at Travers Island, the country home of the New York Athletic Club, after a lapse of twenty years, with a game between representatives of Mineola Aviation Corps and Fort Totten, and the first named won by 9 to 7. Fort Totten got away to a lead with a touchdown by Thompson and a goal by Draper, but the Mineola pigskin chasers came through with a touchdown in the second period and added to this a field goal in the third quarter.

The lineup:

Mineola, (9.)	Position.	Ft. Totten, (7.)
Roberts	L.E.	Buert
Prezona	L.T.	McLoughlin
Gates	L.G.	Beam
Neubig	C.	Caldwell
Weber	R.G.	Kiefofer
Redfield	R.T.	MacKenzie
Loucks	R.E.	McDonald
Watkins	Q.B.	Lamar
Moore	L.H.B.	Draper
Clark	R.H.B.	Thompson
Laurie	F.B.	McCullon

Touchdown—Thompson, Watkins. Goal from touchdown—Draper. Goal from field—Watkins. Substitutions—Lawson for Roberts; Flecka for Weber; Simmons for Moore; Abrams for Buert; Greenbaum for McLoughlin; Buert for McDonald. Referee—C. J. Kilpatrick, Union College. Umpire, Mr. Butterfield, Yale. Head linesman—C. J. Farrell, New York A. C. Time of quarters—10 minutes.

Hydro-Aeroplane Base Established in Washington

Washington.—A hydroaeroplane hangar has just been completed at the Navy Yard, Washington, D. C. It was built in record time, only 18 days being consumed in its construction. It is 100 by 200 feet, having a floor space of 20,000 square feet. The floor and foundations are of concrete, the rest of the structure being of wood. Two concrete runways run from the doors of the hangar to the two launching piers that extend into the river.

The planes that are already here will be housed in the new hangar and it is expected that within a few days the fleet will be complete.

This is the first aeroplane base that has ever been established in Washington, and while it is pointed out that the machines and their pilots probably will never be called upon to combat enemy machines seeking to destroy Washington, they will be here in readiness should their services be required.

Balloon Division Requires Men

Fort Omaha, Neb.—The Balloon Division, Aviation Section, Signal Corps, United States Army, is still enlisting men for the Officers' Reserve Corps, and furnishes perhaps one of the best opportunities left for Americans to get "over there" quickly and see active service with Gen. Pershing's men in France.

These are the qualifications for young officers in this branch of the service:

Applicants must be citizens between nineteen and thirty-five years of age. They must have a good education and be willing to work hard; they must be energetic and forceful and of good moral character and clean habits. After passing the required examination the applicant is first enlisted as a first class private in the Aviation Section of the Signal Enlisted Reserve Corps and then assigned to a school for training, the length of time spent there entirely depending upon the man's ability.

After qualifying as an observation balloon pilot he will be commissioned as a Second or First Lieutenant in the Aviation Section Signal Officers' Reserve Corps. From the time the applicant enters the school until commissioned he receives $100 a month, quarters and food allowance. As a Second Lieutenant his salary is $1,700 a year; as a First, $2,000.

Application blanks can be had by addressing the President, Aviation Examining Board, Fort Omaha, Neb.



A German seaplane of the Albatros type

Perrin with Government Aircraft Plant in Dayton

Dayton.—J. G. Perrin will be connected with the engineering and experimental department of the Government aircraft factory that is to be established here. Perrin is at present connected with the equipment division, plane design section, of the war department and was formerly with the Lozier Motor Co. and the Timken Detroit Axle Co. in Detroit.

Harry Bill is to be factory manager of the aeroplane experimental station at Dayton, Ohio. A factory 60 by 600 ft., two stories high has been completed. Bill was formerly factory manager of the Chalmers Motor Co.

Fliers Here from France

Sergeant Edwin Parsons, Adjutant of the Lafayette Escadrille, arrived recently from France on a three weeks' visit to his family, who live at Springfield, Mass. He said that William Thaw and the remaining ten Americans in the corps had signified their intention of joining the United States Army in France. He will remain in the French Army.

Another American aviator on board was Sergeant Thomas M. Hewitt of New York, who said that he was leaving the Lafayette Escadrille to join the United States Army Flying Corps. He said that there was a strong belief current among the French and British troops that the war would be over in November, 1918.

Lieutenant Georges Flachaire of the French Flying Corps arrived on the same steamship with a Spad machine, which he has used at the front, to give instruction to American army aviators at the training camps. He has brought down seven German aeroplanes and wears the cross of the Legion of Honor and the Military Cross.

Aviators as Trapshooters

Trap shooting has been taken up by the United States government, and traps have been installed in eighty-six various cantonments and aviation schools throughout this country, with the exception of six, which have been sent to France for use among the American aerial forces abroad.

Uncle Sam started out by purchasing 3,000,000 clay birds and equivalent ammunition, and thereafter 1,000,000 a week will be used by Uncle Sam's warriors, chiefly those of the air.

Philadelphia Aircraft Factory

The new naval aircraft factory at Philadelphia, which will be completed this month, will employ about 3,000 men.

The workers who man such plants are of a superior class, and they feel a personal pride in turning out products that will stand the test of conflict with the arms of other nations. A considerable part of the building of war vessels is also done in Government yards.

The United States Civil Service Commission, which is charged with the task of recruiting the ranks of this great civilian army, through its widespread organization is furnishing the men as they are needed. In certain trades, particularly those connected with shipbuilding, there is usually a shortage. Sailmakers, coppersmiths, ship fitters, angle smiths, blacksmiths, and machinists are especially needed. Women to operate power sewing machines are also in great demand.

Assigned to Aircraft Board

Col. H. H. Arnold and Maj. Harold S. Martin, Signal Corps, are appointed members of the Joint Army and Navy Technical Aircraft Board, vice Brig. Gen. B. D. Foulois and Maj. Henry W. Harms, Signal Corps, hereby relieved.

Aviation Station is Likely for Camp Meade

Camp Meade, Md.—Establishment of an aviation station as an adjunct to the 79th Division, according to statements of officers of the Signal Corps here, is a matter of a short time. The station is to include a school of instruction for aviators, among the instructors being officers and non-commissioned officers of the British and French armies who have been assigned to this cantonment.

Aviation as one of the most vitally important phases of the modern art of making war is as necessary as artillery, infantry or any other branch of the service; in fact, more so in some respects, as without the information supplied by observers in war planes scouting above an enemy's line, artillery would be practically useless, as war is now waged, and infantry would be completely exposed to enemy attacks.

It is expected, according to the statements of officers, that the aviation instruction will begin within a few weeks, or as soon as machines are available. Usually, as has already been pointed out in these dispatches, announcement that a new line of work is to be inaugurated soon is followed within a short time by the actual beginning of the work.

NAVAL and MILITARY AERONAUTICS

C. B. Dillingham, Noted Theatrical Manager, is Captain in Signal Corps

Theatrical circles in New York received a pleasant surprise when the War Department orders announced that Charles B. Dillingham, theatrical manager, had been accepted for active service as a captain in the United States Reserves, Aviation Section of the Signal Corps.

With the publication of the order calling Captain Dillingham to the War College at Washington, it became known that on April 2, when President Wilson read his famous war message to Congress, Captain Dillingham went to Washington and offered his services to the government. From then until early in June, when he received his commission, he spent most of his time between Washington and an aviation camp, unknown to his friends.

He asked the War Department to make no announcement of the fact at the time and said that he would like to be able to finish his work for the season if the government would allow him. This meant producing "Cheer Up" at the Hippodrome; Fred Stone's "Jack o' Lantern" and "Miss 1917" at the Century, with Mr. Ziegfeld. The War Department only waited a few hours after the work was finished.

Beyond the fact that he is temporarily assigned to the War College, Captain Dillingham does not know what his duties will be. It is not generally known that he is an expert telegrapher and has made a study of telephone systems for use in war. He also qualifies as an expert on transportation and from having passed part of nearly every summer abroad for twenty years he knows France, Belgium, Germany and Italy about as well as he does New York and New England, and he was born in Hartford. He was a reporter and one of the best in Hartford, Chicago and New York, before he went into the theatrical business and rose to the top.



One of the fast British Scouts equipped with a Clerget Motor built by the Whitehead Co.

Special Orders 251

Major Shepler W. Fitzgerald, Signal Corps, to aviation concentration camp and supply depot, Garden City, Long Island, N. Y.

First Lieut. Floyd A. Miller, Signal Corps, to concentration depot, Garden City, Long Island, N. Y.

Lieut. Col. Ira F. Fravel, Signal Corps, to Chief Signal Officer of the Army for assignment to duty.

First Lieut. James T. Colwick, Medical Reserve Corps, assigned to duty with Aviation Section, Love Field, Hawes, Texas.

Major Patrick Frissell, Signal Corps, to report to the Chief Signal Officer of the Army for duty.

Major Earl L. Canady, Signal Corps, to assume command of the Signal Corps Aviation School at Park Field, Millington, Tenn.

Major George E. Lovell, Jr., junior military aviator, Signal Corps, to assume command of aviation school, Signal Corps, at Camp Taliaferro, Fort Worth, Texas.

Capt. Carl M. Tichenor, Signal Corps, report to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Frederick C. Lewitt, Medical Reserve Corps, active duty with Aviation Section, Signal Corps, University of California, San Francisco, California.

First Lieut. John W. Lee, S. O. R. C., to Camp Travis, Fort Sam Houston, Texas, for duty with 315th Field Signal Battalion.

Second Lieut. George T. Northern, Signal Corps, National Army, will proceed to Camp Alfred Vail, Little Silver, N. J., for duty.

A board of officers to consist of Capt. George L. Jones, Av. Sec., S. O. R. C., and Capt. Louis Levy, Medical Reserve Corps, is appointed to meet at Seattle, Wash., to examine applicants for commission in the aviation section, S. O. R. C.

Capt. James J. Newman, Signal Corps, Dayton, Ohio, for station.

First Lieut. John F. McGough, Av. Sec., S. O. R. C., to proceed to New York City, N. Y., reporting by telegraph to the Chief Signal Officer of the Army for instructions.

First Lieut. John Gordon, Jr., Av. Sec., S. O. R. C., to Langley Field, Hampton, Va., for duty.

First Lieut. Alfred P. Bourquardez, Jr., Av. Sec., S. O. R. C., to Gersinner Field, Lake Charles, La.

First Lieut. George W. Delisle, Av. Sec., S. O. R. C., to aviation concentration camp and depot, Garden City, Long Island, N. Y.

Capt. Ralph S. Rainsford, Av. Sec., S. O. R. C., take station in New York, N. Y., reporting by telegraph to the Chief Signal Officer of the Army for instructions.

Lieut. Colonel Virginus E. Clark, Signal Corps, United States Army, relieved from duty at the office of the Chief Signal Officer and will proceed to McCook Field, Dayton, Ohio, and assume command of the Signal Corps Aviation Station.

The following named officers, Av. Sec., S. O. R. C., to proceed to Houston, Texas, reporting to the commanding officer Elkington Field for duty: Capt. Louis S. Scott, First Lieuts. Charles H. Baetjer, Porter A. Mackall, Lloyd L. Harvey, Torrey H. Webb, Syrus F. Smythe, Lorenzo L. Snow, Logan T. McMenemy, Carter Tiffany, Robert W. Jannus, Benjamin S. Robertson, Jr., Algernon R. Clapp, Charles S. Chase, 3rd.

First Lieut. Lucius P. Ordway, Jr., Av. Sec., S. O. R. C., to School of Military Aeronautics, Cornell University, for duty.

Special Orders 255 and 256

Major Cuthbert P. Stearns, Signal Corps, to Portland, Oregon, for duty.

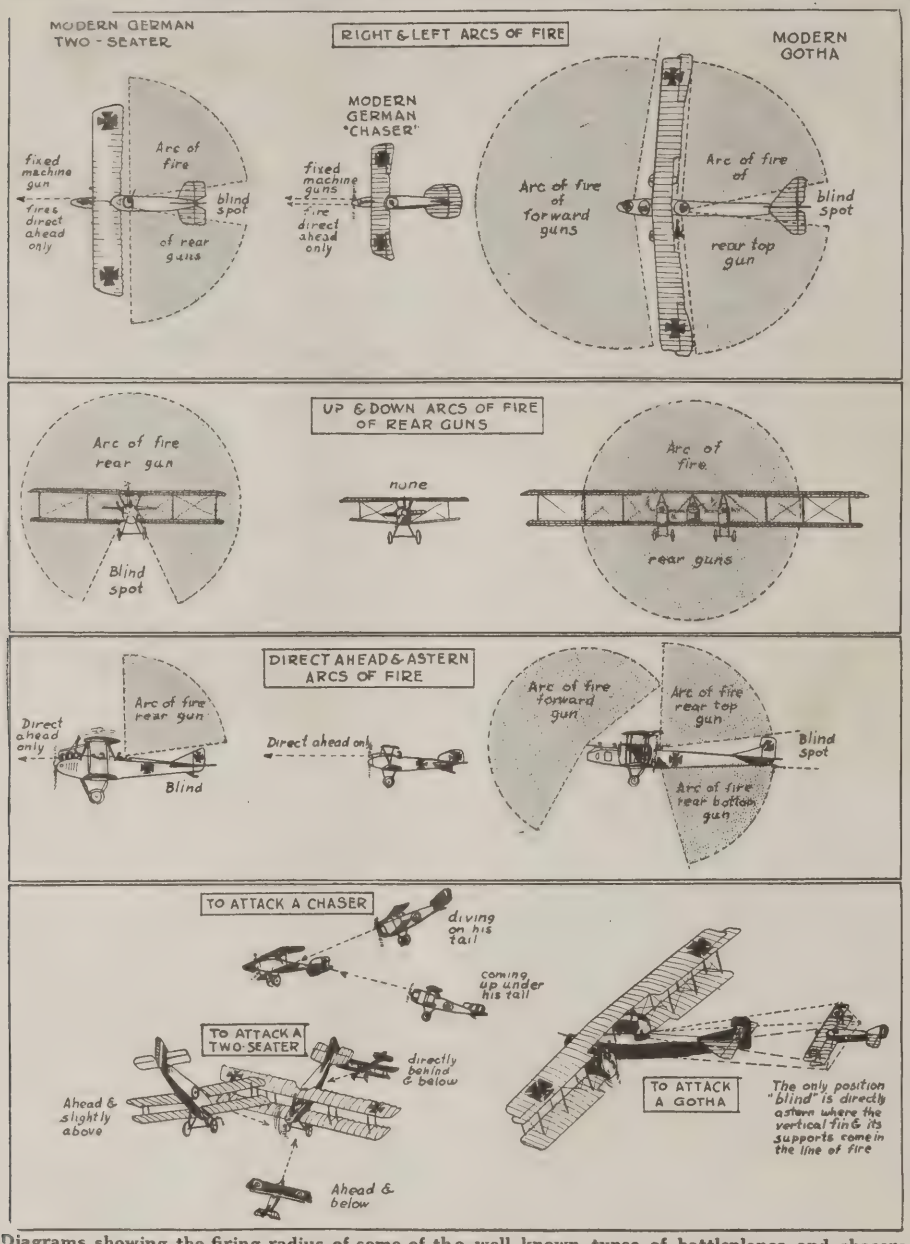
First Lieut. Perry F. Ellsworth, S.O.R.C., to Chief Signal Officer of the Army for duty.

First Lieut. James A. Parnell, S.O.R.C., report to the Chief Signal Officer of the Army for duty.

The following named officers of the Aviation Section, S.O.R.C., are announced as on duty requiring them to participate regularly and frequently in aerial flights from the following dates: First Lieuts. Birge M. Clark, Oct. 3, 1917; Walter J. Reed, Oct. 3, 1917; Maurice R. Smith, Oct. 3, 1917; Robert L. Sparks, Oct. 3, 1917; Ray W. Thompson, Oct. 3, 1917; Spalding W. Ovitt, Oct. 6, 1917; John H. McCauley, Oct. 8, 1917; James P. Haight, Oct. 8, 1917; Edward A. Henske, Oct. 10, 1917; Edgar T. Ferguson, Oct. 12, 1917; Rodger S. McCullogh, Oct. 12, 1917; Sidney I. Howell, Oct. 13, 1917;



Assembly division of the Whitehead Aircraft Factory, Surrey, England



Diagrams showing the firing radius of some of the well known types of battleplanes and chasers in use on the war front. Reproduced through the courtesy of the Illustrated London News

Samuel T. Moore, Oct. 16, 1917; Allan P. McFarland, Oct. 16, 1917; Charles L. Hayward, Oct. 16, 1917; Stuart W. Kellogg, Oct. 17, 1917; Daniel E. Kennedy, Oct. 17, 1917; Thomas D. Jordan, Oct. 19, 1917; Ferdinand R. Wickard, Oct. 21, 1917.

By order of the President, First Lieut. James A. Greig, S.O.R.C., is honorably discharged from the service of the United States.

Capt. James J. Newman, Signal Corps, temporary duty at Dayton, Ohio, to Washington, D. C.

Major Charles H. White, Signal Corps, to the Chief Signal Officer of the Army for duty.

Brig. Gen. Alexander A. Dade, Signal Corps, from duty at the Signal Corps Training School, San Diego, California, to Washington, D. C., reporting to the Chief Signal Officer of the Army for duty.

First Lieut. Gerrard J. Eding, Av. Sec., S.O.R.C., to duty at Buffalo, N. Y.

Col. H. H. Arnold and Major Harold S. Martin, Signal Corps, are appointed members of the joint Army and Navy Technical Aircraft Board, Vice-Brig. Gen. B. D. Foulois and Major Henry W. Harms, Signal Corps, hereby relieved.

First Lieut. Edward Lowe, Jr., Av. Sec., S.O.R.C., to Toronto, Canada, for temporary duty.

Major George E. A. Reinburg, Signal Corps, to duty Kelly Field, South San Antonio, Texas.

First Lieuts. Richard Smith and Theodore P. Walker, Av. Sec., S.O.R.C., to Hazelhurst Field, Mineola, Long Island, N. Y.

Capt. Ogden L. Mills, S.O.R.C., for temporary duty at New York.

First Lieuts. Kenneth L. Moore and Kirk W. Todd, Av. Sec., S.O.R.C., on duty in aerial flights from Oct. 11, 1917.

Major Frank K. Ross, Signal Corps, to Garden City, Long Island, New York.

First Lieuts. Neal Creighton and Fred S. Dunn, Jr., Av. Sec., S.O.R.C., to Balloon detachment Fort Monroe, Va.

Major Frank J. Griffin, S.O.R.C., to the Chief Signal Officer of the Army for duty.

First Lieut. Robert H. Fowler, Medical Reserve Corps, is relieved from duty at Camp Mills, Garden City, Long Island, New York, and is assigned to the Aviation Section, Signal Corps, United States Army, and will report in person to the commanding general, concentration camp, Garden City, for duty and by letter to the Chief Signal Officer of the Army, Washington, D. C.

Special Orders 254 and 255

The following named officers, S.O.R.C., to active duty, reporting to the Chief of the War College Division, Major Steven Bonsal, Capt. Roslyn D. Whitock, Capt. Charles B. Dillingham, Capt. David Keppel, and First Lieut. Albert Gallatin.

Capt. Hiram S. Brown, Av. Sec., S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Merion C. Cooper, Av. Sec., S.O.R.C., to duty Aviation Camp and Supply Depot, Garden City, Long Island, New York.

First Lieut. Willard C. Northup, Av. Sec., S.O.R.C., to Aviation concentration camp and supply depot, Garden City, Long Island, New York.

First Lieut. Philip L. Young, Av. Sec., S.O.R.C., to active duty at Hazelhurst Field, Mineola, Long Island, New York.

Second Lieut. Carl J. Westerlind, Av. Sec., S.O.R.C., to Signal Corps recruiting depot, Fort Wayne, Michigan.

First Lieut. C. Joseph Dexter, Av. Sec., S.O.R.C., is announced as on duty in aerial flights from October 12, 1917.

First Lieut. Harold M. Sanford, Av. Sec., S.O.R.C., is announced as on duty in aerial flights from August 20, 1917.

First Lieut. Robert C. McCreery, Medical Reserve Corps, in addition to his other duties at the United States school for aerial observers, Fort Sill, Oklahoma, assigned as a member of the examining board and as recruiting officer for the aviation, Signal Corps and for the Medical Department.

First Lieuts. Winthrop H. Battles, Kirk W. Todd, Charles N. Snowden and George B. Patterson, Av. Sec., S.O.R.C., to duty at Chandler Field, Essington, Pa.

Major James E. Chaney, Signal Corps, to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. G. Harrison Frazier, Jr., Av. Sec., S.O.R.C., to Aviation concentration and supply depot, Garden City, Long Island, New York.

First Lieut. Edwin S. Ingersoll, to United States school for aerial observers, Fort Sill, Oklahoma.

The following named enlisted men, candidates for commission, now at the Signal Corps Aviation School, Essington, Pa., to duty at the stations indicated: Sergt. Ralph S. Rowe, Privates, First Class, John M. Richardson, Darwin Eugene Bardwell, George Arthur Bond, John H. Buckley, Frederick M. Byerley, Julian Camp, Otto Ferguson, George A. Foss, Donald B. Kennedy, Robert N. McDowell, Wilbur H. McEachron, Harlow R. Price, Paul F. Sanborne, Albert F. Smith and Herbert H. Teichman, to Mount Clemens, Michigan. Privates, First Class, Leroy A. Boutwell, Joseph W. Bruce, Edwin Burge, Stanley Burnham, Joseph W. Burton, W. D. Coney, Carter Luscher, Edwin A. McDonnell, C. M. Moon, Eugene F. Olsen, W. F. Orbison, M. J. Palmer, John W. Powell, Wm. G. Speed, Wm. L. Shaffer, Jesse I. Mennefee, Lawrence J. Kline and George A. Meyler, to San Antonio, Texas.

First Lieut. Joseph J. Reilly, Medical Reserve Corps, on duty with Aviation Section, Signal Corps, as member of the physical examining unit at St. Louis, Mo.

First Lieut. Mann S. Valentine and Second Lieut. Sidney F. Heckert, Jr., Av. Sec., S.O.R.C., to Aviation concentration camp and supply depot, Garden City, Long Island, New York.

First Lieut. Frank Upman, Av. Sec. S.O.R.C., to Garden City, Long Island, New York.

First Lieut. Gerveys Grylls, First Lieut. Harry L. Greaves, and Second Lieut. Jacob E. Kopf, to Garden City, Long Island, New York.

First Lieut. John W. Frewer, Av. Sec., S.O.R.C., to aviation concentration depot, Morrison, Va.

Capt. Reece M. Newport, Capt. H. Stuart Hotchkiss, and Second Lieut. Harold F. Wood, Av. Sec. S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Edward A. Callanan, Av. Sec., S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Wilbur H. Durburough, S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

Major Ray C. Hill, Signal Corps, to Chief Signal Officer of the Army for assignment to duty.

Special Orders 253 and 254

First Lieut. Lawrence B. Laughran, Av. Sec. S.O.R.C., on duty as from October 15, 1917, requiring him to participate in aerial flights.

First Lieuts. Edwin H. Fort and James Suydam, S.O.R.C., to duty at Langley Field, Hampton, Va., reporting to commanding officer of Photographic School.

First Lieut. Howard W. French, Av. Sec. S.O.R.C., to duty at Chandler Field, Essington, Pa.

Second Lieut. William M. Penick, Av. Sec. S.O.R.C., report to Chief Signal Officer of the Army for assignment.

Capt. Robert E. Bell, Sig. Corps, to Aviation concentration camp at Garden City, L. I., N. Y., for assignment.

First Lieut. Rupert L. Maloney, Av. Sec. S.O.R.C., to Chief Signal Officer of the Army for assignment.

Special Orders 252

First Lieut. Joyce R. Kelly, Signal Corps, will proceed to Princeton, New Jersey, and report in person to Capt. H. B. Williams, Aviation Section, S.O.R.C., Princeton University, for assignment to duty.

Lieut. Col. David L. Roscoe, Signal Corps, will proceed via Washington, D. C., to Camp Taliaferro, Fort Worth, Texas, and report on November 10, 1917, to the commanding officer at that place for duty.

First Lieut. Dorr K. Taylor, Aviation Section, S.O.R.C., is relieved from his present duties and will proceed to Richmond, Virginia, and report to the commanding officer, Aviation General Supply Depot in the military service.

First Lieut. John A. Larkin, Aviation Section, S.O.R.C., will repair to this city and report in person to the Chief Signal Officer of the Army for duty.

Capt. Claude Mitchell, S.O.R.C., will proceed to this city and report in person to the Chief Signal Officer of the Army for duty in his office.

A board of officers to consist of: Capt. H. C. Allen, Aviation Section, S.O.R.C., and First Lieut. Theodore S. Blakeley, Medical Reserve Corps, is convened to meet at Kansas City, Missouri, for the purpose of examining applicants for commission in the Aviation Section, S.O.R.C.

Aviation Section, S.O.R.C. Officers

To Aviation concentration camp and supply depot at Garden City, L. I., N. Y., for duty: Second Lieutenants Roland E. Coate, George B. Cummings, Arthur H. Hoddick, George S. Koyl, Neil C. McMath, Harry J. Robinson, Jr., John R. Tilton, Jr.

First Lieuts. Jay H. Cather and John O. Fuchs, Av. Sec., S.O.R.C., to report to Chief Signal Officer of the Army for duty.

The assignment of Major Chalmers G. Hall, U. S. Army, retired (now Lt. Col., Sig. Corps.), to duty at office of the Chief Signal Officer of the Army is confirmed.

Orders directing Captain Schuyler Schieffelin, Sig. Corps, to report to Kelly Field, South San Antonio, Tex., for duty are amended to direct Captain Schieffelin to proceed to Aviation concentration camp and supply depot at Garden City, L. I., N. Y., for duty.

First Lieut. Theodore Arter, Av. Sec., S.O. R.C., announced on duty requiring him to participate in aerial flights from October 5, 1917.

Major John E. Rossell, Sig. Corps, to report to Chief Signal Officer of the Army for temporary duty, and upon completion to proceed to Ellington Field, Houston, Tex., to assume command of the Aviation School at that place.

The following named officers of the Av. Sec. S.O.R.C., are announced as on duty requiring them to participate in aerial flights: First Lieut. William T. Campbell, from Oct. 11, 1917, First Lieut. Thomas J. Hilliard, from Oct. 11, 1917, Elliott P. Hinds, from August 6, 1917.

Paragraph 100, Special Orders, No. 229, Oct. 2, 1917, War Department, relating to First Lieut. Lonnie H. Lee, Aviation Section, Signal Officers' Reserve Corps, is amended so as to direct Lieutenant Lee to proceed to Call Field, Wichita Falls, Tex., in time to arrive there on November 10, 1917.

Paragraph 67, Special Orders, No. 230, War Department, October 3, 1917, relating to Maj. Richard B. Barnitz, Signal Corps, now at Kelly Field, South San Antonio, Tex., is amended so as to direct Major Barnitz to proceed to Love Field, Dallas, Tex., in time to arrive there on November 10, 1917.

Paragraph 85, Special Orders, No. 229, War Department, October 2, 1917, relating to Major Douglas B. Netherwood, Signal Corps, is amended so as to direct Major Netherwood to proceed to Love Field, Dallas, Tex., in time to arrive there on November 10, 1917.

Paragraph 147, Special Orders, No. 230, Oct. 3, 1917, War Department, relating to Capt. Joseph F. Pourrone, Aviation Section, Signal Officers' Reserve Corps, is amended so as to direct Captain Pourrone to proceed to Park Field, Millington, Tenn., in time to arrive there on November 10, 1917.

Paragraph 90, Special Orders, No. 229, War Department, October 2, 1917, relating to Capt. J. Stanley Foster, Aviation Section, Signal Officers' Reserve Corps, is amended so as to direct Captain Foster to proceed to Rich Field, Waco, Tex., in time to arrive there on November 10, 1917.

Paragraph 138, Special Orders, No. 229, War Department, October 2, 1917, relating to Capt. Albert P. Loening, Aviation Section, Signal Officers Reserve Corps, is amended so as to direct Captain Loening to proceed to Love Field, Dallas, Tex., in time to arrive there on November 10, 1917.

Paragraph 43, Special Orders, No. 230, War Department, October 3, 1917, relating to First Lieut. Harold Imbrie, Aviation Section, Signal Officers' Reserve Corps, is amended so as to direct Lieutenant Imbrie to proceed to Call Field, Wichita Falls, Tex., in time to arrive there on November 10, 1917.

Paragraph 145, Special Orders, No. 230, War Department, October 3, 1917, relating to First Lieut. Harley W. Lake, Aviation Section Signal Officers' Reserve Corps, is amended so as to direct Lieutenant Lake to proceed to Love Field, Dallas, Tex., in time to arrive there on November 10, 1917.

Special Orders 257

Orders relating to First Lieut. Harry L. Greaves, Av. Sec., S.O.R.C., are amended to read First Lieut. Harry F. Greaves.

Brigadier-General Alexander L. Dade, Signal Corps, to report to the Chief Signal Officer of the Army for duty, relieving Brigadier-General Benjamin D. Foulois.

First Lieut. George Young, Jr., Av. Sec., S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Luther Kyttle, S.O.R.C., to duty as signal supply officer, Camp Dix, Wrightstown, New Jersey.

Second Lieut. Robert E. Christie, Jr., Av. Sec., S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.

Second Lieut. William H. Fitzpatrick, Jr., Av. Sec., S.O.R.C., to the Chief Signal Officer of the Army for assignment to duty.



Students of the Royal Navy Air Service Flying School being instructed in the principles of aero-motor operation

The following named officers, Av. Sec., S.O. R.C., to aviation concentration camp and supply depot, Garden City, Long Island, New York: First Lieuts. Gordon Allen, George Guppy, J. Lovell Little, Alexander R. Manson, Lyman S. McConnell, Lewis S. Newman, Edward G. Tourison, Oscar V. Vatet, Marion S. Wyeth, and Second Lieuts. Edward P. Christie, Francis J. Creamer, Joseph I. Dise, Ralph Earle, Edwin H. Finken, Frank L. O'Connell, Oliver E. Reagan, Ralph E. Schenck, Edward H. Shea, William T. Sturges.

Capt. Clayton E. Emig, Av. Sec., S.O.R.C., to Signal Corps supply depot, Middletown, Pa.

Orders issued assigning First Lieuts. George R. Galbreith, William H. Bleecker, and Othello H. Schroedl, Av. Sec., S.O.R.C., is amended to read Second Lieuts.

First Lieuts. Norvell P. Chapman, and Ernest F. Lewis, Av. Sec., S.O.R.C., to Kelly Field, South San Antonio, Texas.

So much of paragraph 111, Special Orders 238, as relates to Capt. John H. Alden, Av. Sec., S.O.R.C., is revoked.

First Lieut. Dayton Voorhees, Av. Sec., S.O. R.C., to the Chief Signal Officer of the Army for assignment to duty.

The following named officers, Av. Sec., S.O. R.C., to aviation concentration camp and supply depot, Garden City, Long Island, New York: First Lieuts. Lulian N. Dowell, Alonzo M. Drake, Victor J. Picard and Victor H. Strahm.

Second Lieut. Philip C. Baker, Av. Sec., S.O.R.C., to aviation concentration camp and supply depot, Garden City, Long Island, N. Y.

The following named officers, Av. Sec., S. O. R. C., to duty aeronautical general supply and concentration camp, Garden City, Long Island, New York: First Lieut. Lawrence G. Brower, Willis A. Diekema, Charles S. Jones, Charles R. Melin, Herbert A. Schafner, Cecil P. Young.

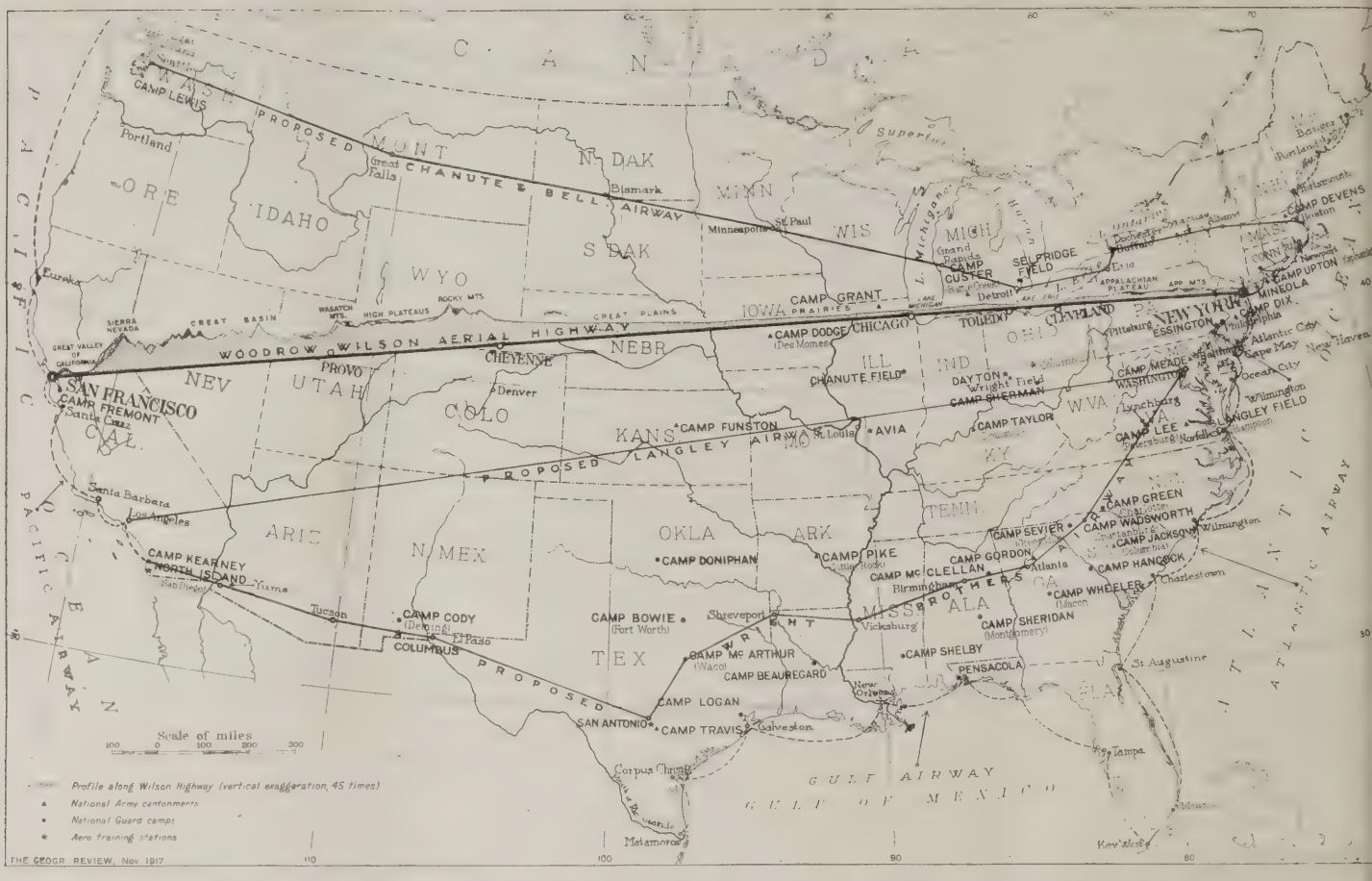
First Lieuts. Edward Hinman, Jr., and Robert Von Ezdorf, Jr., and Second Lieut. George E. Ramey, Av. Sec., S.O.R.C., to aviation concentration camp and supply depot, Garden City, Long Island, N. Y.

Capt. Rodman Gilder, Av. Sec., S.O.R.C., to school of military aeronautics, Cambridge, Mass.

(*Continued on page* 429)



Engine Room at the R. N. A. S. School showing various types of engines under consideration by students



Map showing the proposed Woodrow Wilson, Wright Brothers, Langley, and Chanute and Bell Airways across the Continent and the Atlantic Airway, Gulf Airway and Pacific Airway. Chains of landing places for aircraft are to be established along these airways and along the routes between the main airways which will be established as fast as occasion demands. The Aero Club of America is calling the first meeting of representatives of government, scientific and civic organizations united to co-operate in carrying out the plan. It will be held at the Grand Central Palace, New York City, during the second Pan-American Aeronautic Exposition, February 16 to 23, 1918

TO ESTABLISH FOUR AIRWAYS ACROSS THE CONTINENT AND USE MAIL CARRYING PLANES TO KEEP MANUFACTURERS BUSY AND TRAIN AVIATORS

THE Executive Committee of the Aero Club of America has approved the plan of establishing four transcontinental airways, instead of one, as was originally planned, and Mr. Alan R. Hawley, the Chairman of the Executive Committee, has advised Rear Admiral Peary, the Chairman of the Committee on Landing Places of the Aero Club of America, to make all possible haste in carrying out this plan, so that work may be given to the manufacturers of aeroplanes and motors who idle through lack of Government orders, and to the hundreds of men who cannot be taken into the Army and Navy Air Service now, and would like to keep up their training in flying until such time as the Government can admit them into the Air Service.

The Committee on Landing Places of the Aero Club of America, of which Rear Admiral Peary is Chairman, and Henry Woodhouse is Vice-Chairman, proposes four transcontinental airways, to be named: THE WOODROW WILSON AIRWAY, THE WRIGHT BROTHERS AIRWAY, THE LANGLEY AIRWAY, and the CHANUTE AND BELL AIRWAY. It also proposes to have these transcontinental airways interconnected by "air-routes," the principal of which will be named in honor of pioneers in aeronautics and government officials who have contributed to the development of aeronautics.

The four transcontinental airways will be as follows:

(1) THE WOODROW WILSON AIRWAY: which is a straight line from New York to San Francisco, touching Cleveland, Toledo, Chicago and other important cities on the way to San Francisco. The straight line has been generally approved because it represents the best principle of air travel, which can be done in a straight line, as the aviators can make their own route, flying over all obstructions.

(2) THE WRIGHT BROTHERS AIRWAY: Starting from Washington going through North Carolina, the State where the Wrights made the historic first flight, through Georgia, Alabama, Mississippi, Louisiana, Texas—with a station at San Antonio, where an aeroplane—a Wright machine—was used for the first time in history under conditions approximating warfare, then through New Mexico, and Arizona, ending at San Diego, Cal.

(3) THE LANGLEY AIRWAY: The general opinion is that this airway should start in Washington and end at Los Angeles.

(4) THE CHANUTE AND BELL AIRWAY: extending from Boston, Mass., to Seattle, touching Albany, N. Y., Syracuse, Rochester, Erie, Buffalo, Detroit, Grand Rapids, Mich., Minneapolis, Minn.; Bismarck, N. D.; Great Falls, Montana, and other cities along the route.

In naming the Northern airway Chanute and Bell Airway there is implied recognition of not only the two pioneers, Octave Chanute and Alexander Graham Bell, but also Mrs. Bell, whose financial support to the Aerial Experiment Association in 1907-1908 made possible the experiments which resulted in Messrs. Glenn H. Curtiss and J. A. D. McCurdy, taking an active part in the development of aeronautics.

Atlantic, Gulf and Pacific Airways

The Atlantic Airway will extend from Bangor, Me., to Key West, Fla., and will touch every important city on the Atlantic seaboard; the Gulf Airway will extend from Key West to the mouth of the Rio Grande, following the coast and touching every important city on the Gulf seaboard. The Pacific Airway will extend from San Diego to Puget Sound, following the coast-line, touching every city on the Pacific seaboard.

A number of important considerations must be borne in mind in planning the transcontinental airways, some of which are as follows:

(*Continued on page* 436)

THE ITALIAN SV 200 H. P. FIGHTING SCOUT

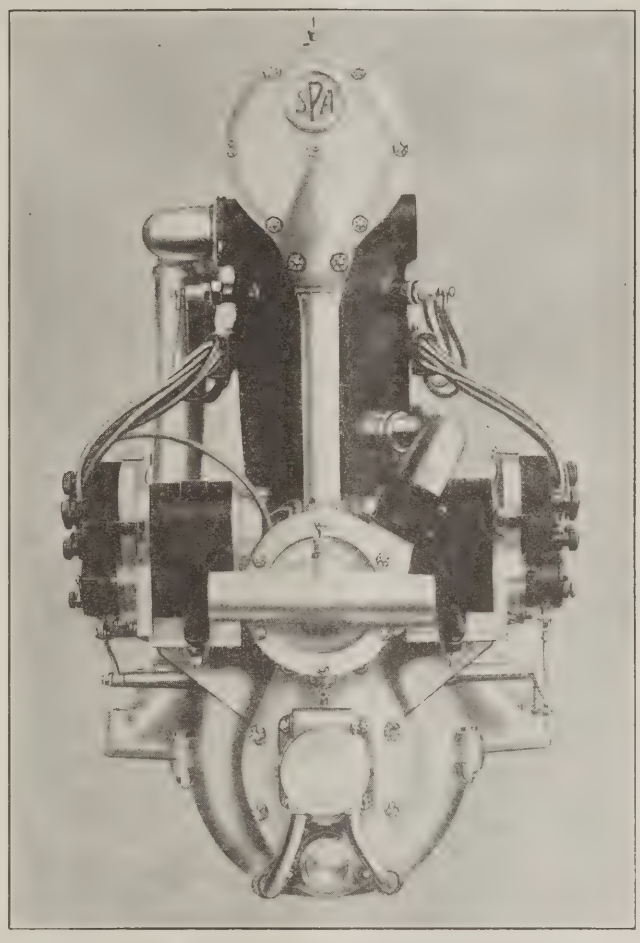
LIEUT. GINO GIANFELICE, one of the Italian aviators according to published reports, reached an altitude of 24,000 feet in an "SV" aeroplane on the afternoon of November 9. The flight was held under official auspices and was to test the machine which is comparatively new. The "SV" is the fastest of any of the Italian machines in America. The report of this flight probably has reference to the "SV" machine which is equipped with a SPA 150 h.p. motor, or sometimes with a Hispano-Suiza 200 h.p. motor. The report did not state which motor was used.

The "SV" is a single-seater scout tractor. Struts are of steel tubing, inclined so as to do away with the wiring which is usually employed to take care of the lift and landing strains on the wings. The incidence wiring conforms to the customary practice. In aggressive aerial tactics its speed and armament are the principal features of its formidability. A speed of 139 miles an hour is claimed for the "SV" when flying near the ground. Two Vickers machine guns are arranged to fire through the propeller. The opening at the side of the fuselage, at the level of the propeller hub, shows the location of the machine guns.

The upper plane has a span of 30'-3 5/16"; overall length, 29'-0⅝"; overall height, 9'-1". Area of the lifting surface, 261 square feet. Weight of the machine empty, 1,267 lbs.; gross weight, 1,763 lbs. In the gross weight a military load of 495 lbs. is distributed as follows: Fuel and oil sufficient for an air endurance of 2½ hours, 220 lbs.; pilot, 176 lbs.; the two Vickers machine guns, 99 pounds. The loading of the machine is 7.2 lbs. per sq. ft. of surface and 10.1 lbs. per b.h.p.

In 1 minute and 40 seconds the "SV" can climb to 3,250 feet; 4 minutes 30 seconds, 6,500 feet; 8 minutes, 10,000 feet; 12 minutes and 50 seconds, 13,000 feet.

The SPA-6A engine, which is installed in the "SV" shown in the accompanying illustration, is a 6-cylinder water-cooled engine having a nominal h.p. of 100, and which shows a normal h.p. on a bench-test of 220 at 1,600 r.p.m. Bore and stroke, 5.31 by 6.69 inches. Overall dimensions of the SPA engine: Length, 5'-1 1/16"; height, 3'-3 1/16"; width, 1'-6⅛".



Magneto end of the 200 H.P. Spa Engine

Weight of the engine complete, dry, 564.22 lbs.: weight per b.h.p., 2.55 lbs. Two Zenith carbureters and two Type N2 Marelli magnetos are used. Gasoline is consumed at the rate of 99.4 lbs. per hour; 7.6 ounces per b.h.p. Lubricating oil is consumed at the rate of 7.05 lbs. per hour; 0.53 ounces per brake horsepower.



The Italian S V Fighting Tractor equipped with a Spa 200 H.P. Engine and provided with two Vickers Machine Guns. This machine can climb 10,000 feet in 8 minutes with a military load of 500 pounds. (Official Italian photo)

NEW AERONAUTIC STANDARDS

A TWO-DAY meeting of the S. A. E. standards committee aircraft division was held at the Bureau of Standards, Washington, October 27th and 28th, when a considerable number of important aircraft standards were placed on the records of the Society. Amongst the subjects discussed were dope, varnish, engine testing, engine weight specifications, glue, heat treatment of frame joints, land air pumps, pipe fittings, pontoon fittings, propeller shaft ends, safety belts, screws and bolts, spark plug shells, tachometer drive, and wheels. The International Aircraft Standards Board is co-operating very closely with the S. A. E., and its representatives took part in the discussion very helpfully. The appreciation of the entire aeronautic industry is due the chairmen of committees, who made final reports on the work of their divisions, one of the most complete being that on screws and bolts, submitted by Mr. Ehrman.

The meeting was called to order by Chairman Manly, who advised that the object of the meeting was to take action on a number of reports that had been prepared by the Sub-committee and to transact such other business as was necessary.

Dope

Mr. W. H. Smith, Chairman of the Dope Committee, presented final report.

Mr. Manly asked for any experience bearing on the recent practice of coating the fabric with dope only and eliminating the varnish coat which is intended to protect the dope from the effects of the weather. He also wanted to know whether it would not be a good plan to tear the fabric off the wings at definite intervals in order to make a thorough inspection of the wing structure, the same as an engine is overhauled every so often. Col. Goodier said that this might be a good plan if men and material were available in abundance, but under conditions as they actually exist it would be a waste of time and materials. Aside from the question of skin friction, an undoped wing cannot be used because it does not protect the interior parts of the wing from rust, which is a cause of considerable trouble at Essington. The fabric can be left on till it is rotted. It will still hold after it has so much deteriorated that one can punch a hole through it with the finger. Furthermore, quite a large hole in the fabric, large enough, say, to put one's head through, will not prevent the aviator from flying his machine, according to Capt. Ocker. As to the deterioration of interior parts, as, for instance, the weakening of the spars, this can be observed by the aviator while up in the air, by the bending or bowing of wings, and it is then still time to land and make an investigation. Regarding the durability of the fabric, Capt. Ocker said this depended largely on the use the machine gets. On seaplanes, where the wings are often wetted, the fabric rots more quickly than on land machines, on which it may last for a couple of years. Another sign of weakening of the wing structure is the wrinkling of the fabric.

The report on dopes was accepted without further discussion.

Changes in Acetate Dope Specifications

Following are the changes made in the dope specifications as compared with those printed in a previous issue of AERIAL AGE:

In the first paragraph it is specified that the residual film should be reasonably transparent and free from white spots. The increase in weight per sq. in. of doped fabric is now limited to 2 oz. minimum and 2.75 oz. maximum, and this test is to be made on standard fabrics. Dopes containing tetracholorethane, while not acceptable for Signal Corps repair work, will be permissible in factories with adequate ventilation. The cellulose acetate used should contain no free mineral acid and not more than 0.1 per cent of acetic acid.

In the dope test one side of the fabric mounted on a frame is to remain uppermost throughout. This test is to be made in duplicate. The test specified under this heading is to remain in effect until a mechanical test is adopted. In the sulphate test 20 grams of cellulose acetate dope are treated with 150 c. c. of water in a pressure bottle at 100 deg. for 24 hr. In the test for the amount of cellulose acetate it is specified to pour 25 grams of the dope into a Petri dish 6 in. in diameter and evaporate to dryness on the steam bath. Extract the residue with ether in a soxhlet until all extractive material has been removed. Dry at 60 deg. to constant weight and weigh.

Nitrate Dopes

Separate specifications are now printed for cellulose nitrate dopes. These in general are identical with the specifications for the acetate dope, the differences being as follows:

In the specifications for cellulose nitrate dopes, under the heading of Acidity, it is specified that the amount of free organic acidity, figured as acetic acid, may not exceed 0.05 per cent (instead of 0.2 for the cellulose acetate dope).

The paragraphs in the cellulose acetate specifications headed Sulphates, Tetrachlorethane and Cellulose Acetate are replaced by a paragraph headed Cellulose Nitrate, which reads as follows: "The cellulose nitrate used in the manufacture of dope shall be purified and give a negative potassium iodide test at the end of 20 min., according to the standing method of the Bureau of Ordnance. The amount of cellulose nitrate used shall be not less than 35 grams per liter of dope."

The paragraph describing an inflammability test is omitted.

In the paragraph describing a test for acidity the last portion beginning "some dopes; notably those containing much acetone," is omitted. To the portion of the paragraph which remains is added the sentence to the effect that "any satisfactory substitute method will be permissible on approval."

For the paragraphs on sulphates and amount of cellulose acetate is substituted a paragraph on amount of cellulose nitrate, which reads as follows: "Pour 25 grams of the dope into 100 grams of chloroform, stirring constantly. Extract in a soxhlet with chloroform until all extracted material has been removed. Dry at 60 deg. C. to constant weight and weigh."

Col. Goodier was called upon for his views on the dope situation and advised that in general the dope was fairly satisfactory, but, of course, it would be preferable if it would stand weathering a little better and above all should be non-inflammable, as fliers are all scared of fire, particularly with air-cooled rotary motors. The fear, however, is not only confined to the air-cooled rotary, as fires have been caused by back-fire from the ordinary V type and six-cylinder water-cooled engines. The dope should also be light and smooth so as to lower the skin friction.

On motion by Mr. Mork, seconded by Mr. J. C. Roche, the dope specification as presented by Chairman Smith was unanimously adopted.

Varnish

Chairman Percy H. Walker presented final report on Varnish. He advised that they were still working on enamelled and colored coatings, but they were not in a position as yet to make definite recommendations. As information concerning the most desirable colors to obscure the aeroplanes when in flight was desired, Mr. Hanks was instructed to correspond with the Army and Navy and ascertain the colors they would recommend, setting forth in his letter to them the importance of keeping the number of colors as low as possible on account of the difficulty of making a satisfactory airplane varnish when mixed with color pigments.

Dr. Walker said that while the varnish specification was possibly not quite as complete as he would like to have it, it nevertheless was the unanimous opinion of the Varnish Committee that it represented the very best specification that could be compiled, considering the present state of the art.

Discussion on the weight of varnish per square yard was led by Mr. Crane, and it was pointed out that inasmuch as there was a limit to the weight of the fabric as well as the dope per square yard that some limitation should also be put upon the varnish. It is suggested that Dr. Walker and his Committee give further consideration to this point.

On motion by Mr. Pulsifer, duly seconded, the report was unanimously adopted.

Engine Testing Form

In the absence of Mr. H. E. Morton, Acting Chairman, Mr. Hanks advised that there was no change in the recommendation as previously presented. Copies of the recommended forms had previously been sent to the members of the division and there were no adverse comments. Mr. Manly advised that if there were no objections to the report as previously presented, it be considered approved. There were no objections. Engine testing form follows:

S. A. E. Engine Testing Forms—Specification Sheet

Name and Model.....Date of Test.....
Manufacturer .....

*(1) General Type.....Cycle.....
(2) No. of Cycle.....Bore.....in., Stroke.....in., Piston Displ. per Cyl.....cu in., Total.....cu in.
(3) Compression Vol. (Vc).....cu in., Total Vol. of Cyl. (V).....cu in.,

$$\text{Compression Ratio} = \frac{\text{Comp. Vol.}}{\text{Total Vol.}} = \frac{\text{Vc}}{\text{V}} = \text{Compression Pressure}$$

.....lb. Gage at.....r.p.m.
(4) Type of Cyl.....Matl.....
(5) Type of Valves.....Location.....
(6) Cooling System .....
Type Pump.....Capacity.....r.p.m Eng. Speed.....Weight of Water in Cyl. Jackets .....Space between Water Jacket & Cyl. Wall, Top.....Bottom.....
(7) Piston, Type.....Matl.....
Weight without Pin & Rings.....With Pin & Rings.....
Distance from center of Pin to Top of Piston.....
Length, overall .....
.....Clearance Main Body.....Top.....
Length Piston Clearance at Head.....
Length Relieved Portion at Center, if any.....
(8) Piston-Rings, No. per Piston.....Type.....
Width.....in.
(9) Connecting Rod Type.....Matl.....
Length, c. to c.....Weight, Upper End.....Lower End .....Total.....No. Bolts in Lower End.....
Dia. Bolts.....Mtl.....Weight Complete with Bearing.....
(10) Piston Pin Bearings, dia.....Length.....Matl.....
Location.....Method of Fastening Pin in Rod or Piston.....Weight of Pin.....
(11) Connecting Rod Bearing, dia.....Length.....Matl.....
Type.....Weight.....Method of Adjustment.....
.....Method of Holding Bearing in Rod .....
12) Crank Shaft, Type.....Weight.....
No. of Bearings.....Dia. Main.....Length of Front .....Length Intermediate.....Length Rear .....Method of Adjusting Bearings.....
No. of Bolts each Bearing.....How Held in Case.....
.....Dia. Hole in Crank Pins.....
Dia. Hole in Main Bearings.....Cheek Thickness next to Propeller End .....
Cheek Thickness of Balance of Crank.....
Dia of Shaft through Radial Bearing.....
(12) No. of Radial Bearing.....No. of Thrust Bearing.....
Type of Thrust Bearing.....If Direct, what Type.....
Propeller Mounting.....Length of Taper.....
.....Dia.....Method of Holding Propeller Hub .....No. of Hub.....If Geared, how is Gear held to Shaft.....If Taper give Length.....Dia.....Is Radial used in Addition to Plain Bearing .....
(13) Camshaft Bearings, No.....Dias.....
Material .....Lengths .....
(14) Type of Cams.....Type of Valve-Lifters.....
(15) Inlet Valves, No. per Cyl.....o. d.....in
Port Dia.....in., Lift.....in., Seat Angle.....deg. ..
(16) Exhaust Valves, No. per Cyl.....o. d..... in., Port Dia.....in., Lift.....in., Seat Angle .....deg.....
(17) Weight of Valve Reciprocating Parts, Inlet..... lb., Exhaust.....lb.
(18) Valve-Spring Tension, Inlet Open.....lb. Closed .....lb., Exhaust Open.....lb. Closed .....lb.

*See Notes Corresponding to Numbers under "Rules and Directions."

(19) Valve-Timing, Inlet Opens.....deg.....
Top Center, Closes.....deg. After Lower Center
Exhaust Opens.....deg. After Lower Center,
Closes.....deg.....Top Center.
(20) Geared Drive, Pitch.....No. Teeth Crank Shaft Gear.....No. Teeth Propeller Gear.....
Width of Face.....Type Gear.....
Matl.....
(21) Propeller Shaft, Type Thrust Bearing.....
No.....Radial Bearing, Front.....Rear.....
Type of Propeller Hub Mounting.....
No. of Hub.....

Carburetion

(22) Carbureter, Name and Model .....
(23) Specification (Size of Nozzles, etc).....
(24) How Heated .....
(25) General Principles of Operation.....
.....
(26) Description of Intake Pipe.....
.....

Ignition

(27) Name and Type of System .....
(28) Type of Distributor.....Firing Order.....
(29) Type of Breaker.....Maximum Spark Advance .....deg. Retard.....deg.
(30) Spark-Plugs, Name and Type.....How Many.....
Size.....in.

Lubrication

(32) Type and Description .....
Pressure Used .....
(33) Main Bearing Hub .....
(34) Crank Pin .....
(35) Cylinder .....
(36) How is Oil Cooled .....
(37) Capacity of Oil Container .....
(38) What Type Pump .....
(39) Oil Used .....

Engine Weight Specifications

In the absence of Mr. Crane, Chairman of this Sub-committee, Mr. Hanks advised that their report was ready for action and that he understood from Mr. Cautley that the specification was reasonably satisfactory to Major Vincent, at least, as good as could be made with the information available.

On motion by Mr. J. E. Hale, duly seconded, it was unanimously voted to accept the recommendation. The engine weight specifications follow:

Manufacturer .....
Model .....
Bore.....in.....mm. Stroke.....in.....mm.
No. of cyl.....Type.....
Piston displacement.....cu. in.....liters
Compression ratio.....
Horsepower.....at.....R.P.M. H.P. Computed at standard barometric pressure 29.92 in. (76 cm.), 32°F (0°C), 45° latitude at sea level.
Gasoline Consumption.....lbs.....kilos. per hour at above H.P.
Oil Consumption.....lbs.....kilos. " " " " "
Propeller speed.....R.P.M. at above engine speed.
Weight of engine, dry.....lbs.....kilos.
Weight of engine includes the following:

1. *Ignition*—Service Magneto, Wire and Wire Supports or Battery Ignition Distributor and Coils, Wire and Wire Supports, Spark Plug.
2. *Generator* (if used)—With cut-out, etc., and ammeter.
6. *Carbureters.*
7. *Inlet Pipes.*

Spark Plug.

Above numbers refer to parts given in following schedule:

Comparison of standard water-cooled engines, with rotaries and fixed air-cooled types, may be made by means of attached schedule of weights.

Give all weights in the following schedule in the proper column, and give names and weights of any other necessary parts not listed.

Mark (x) if not used.		Manufactured by	Weights. Included in above Eng. weight. Lbs.	Kilos.	Not included in above Eng. weight. Lbs.	Kilos.
( )	1. *Ignition*					
	a—Service magneto (No. required——) with attaching bolts or clamps, and complete drive.....					
	Wire and wire supports.....					
	Switch.....					
)	b—Starting magneto with attaching bolts or clamps, and complete drive.....					
	Wire and wire supports.....					
	Switch.....					
)	c—Battery Ignition Distributor No. required——) with bolts or clamps and complete drive.....					
	oi (No. required———).....					
	Wire with wire supports.....					
	Switch.....					
( )	d—Battery: (Capacity ———A.H.) (Voltage———)..... Box, hold-down clamp and cover.....					
( )	e—Spark-plugs: (No. required———)					
( )	2. *Generator*					
	(Type of regulation———) a—Complete with cut-out, regulator, drive, bolts or clamps.....					
	Is ignition distributor included?.....					
)	b—Ammeter (or voltmeter).....					
( )	3. *Electric Starter*					
	a—Motor with gear-shift drive, mounting brackets, strap, bolts and terminals (starting wire on fuselage)...					
	b—Starting battery: (Cap.———A.H.)..... (Voltage———)..... Terminals.....					
	Switch.....					
	Box and hold-down clamps					
( )	4. *Compressed Air Starter*					
	a—Starter and compressor complete with gear-shift, drive, and all piping except between starter and tank.....					
	b—Air storage tank with straps, etc.....					
	c—Control valve.....					
	d—Pipe Couplings..... (piping on fuselage)					
( )	5. *Hand-Starting Cranks* incl. attaching bolts and nuts					
( )	6. *Carbureters* (No. required ———) with attaching bolts and nuts					
( )	7. *Inlet Pipes* with bolts and nuts					
( )	8. *Hot Air Pipes or Stoves*					
( )	9. *Exhaust Pipes* with flanges and attaching bolts and nuts					
( )	10. *Mufflers* (No. required ———).....					
( )	11. *Propeller Hub* complete with bolts and nuts					

Mark (x) if not used.		Manufactured by	Weights. Included in above Eng. weight. Lbs.	Kilos.	Not included in above Eng. wgt. Lbs.	Kilos.
( )	12. *Gasoline Air Pressure Pump* with drive, bolts and nuts (piping on fuselage)					
( )	13. *Gasoline Pump* with drive bolts and nuts (piping on fuselage)					
( )	14. *Tachometer Gear Drive on Engine*					
( )	15. *Machine Gun Timing Mechanism*					
( )	16. *Water Radiator* (No. required.....).. a—Water radiator connections to engine manifolds					
( )	17. *Oil Radiator or Tank* with connections					

Mark (x) if not used.		Manufactured by	Weights. Included in above Eng. weight. Lbs.	Kilos.	Not included in above Eng. wgt. Lbs.	Kilos.
( )	18. *Oil Capacity of Crank Case*					
( )	19. *Water Capacity of Jackets, Pumps and Manifolds*					
( )	20. *Water Capacity of Radiators*					

Glue

Mr. Johnson, Chairman of the Glue Committee, presented his report and Mr. Hanks asked for information as to exactly what the 2200 lb. weight meant. Mr. Johnson advised that this was 2200 lbs per sq. in. of glued surface. It was then suggested that this fact be incorporated in the specification. With this incorporation Mr. Hale moved that the specification be adopted. Motion duly seconded and unanimously carried.

The whole subject is one concerning which discussion is invited, and written communications should be addressed to Mr. Hanks, Standards Committee of the S. A. E., 29 West 39th Street, New York.

Heat Treatment of Frame Joints

Chairman Manly advised that this was a very important subject and that a committee should be appointed at an early date for investigation. He also advised that some preliminary tests had been made at the Curtiss plant on joints that had been welded. Some of the joints had been heat treated by using a soft gas flame in contrast with the sharp acetylene flame to relieve the strain and refine the material as far as possible. Other joints which had been welded up at the same time were put into the heat treating oven, raised to a temperature of 1650 degrees quenched and drawn at 900 degrees. The latter form of treatment seems to be the more preferable from the standpoint of joint tratment. On the other hand, long tubes are sometimes required and it becomes a pretty serious matter to put the whole piece of framing in the heat treating furnace and keep the frame from warping. For this reason if means for refining the joint itself can be developed, it will be preferable to heat treating the entire frame.

As there was no further discussion, the subject was set aside for future consideration. No committee appointed.

Hand Air Pumps

Col. Goodier and Capt. Oker advised that in general the hand air pumps were satisfactory but the pipe fitting and valves might be improved upon as they were continually coming loose and leaking, due to vibration. Flyers use tape quite often to keep packing and union nuts from unscrewing. Mr. Hanks was requested to confer with manufacturers with a view of getting better pump fittings and locking devices.

Inspection Methods

Mr. Hanks advised that this subject was being taken care of by the I. A. S. B., and until report was received from them, no action was necessary.

Tension Wire

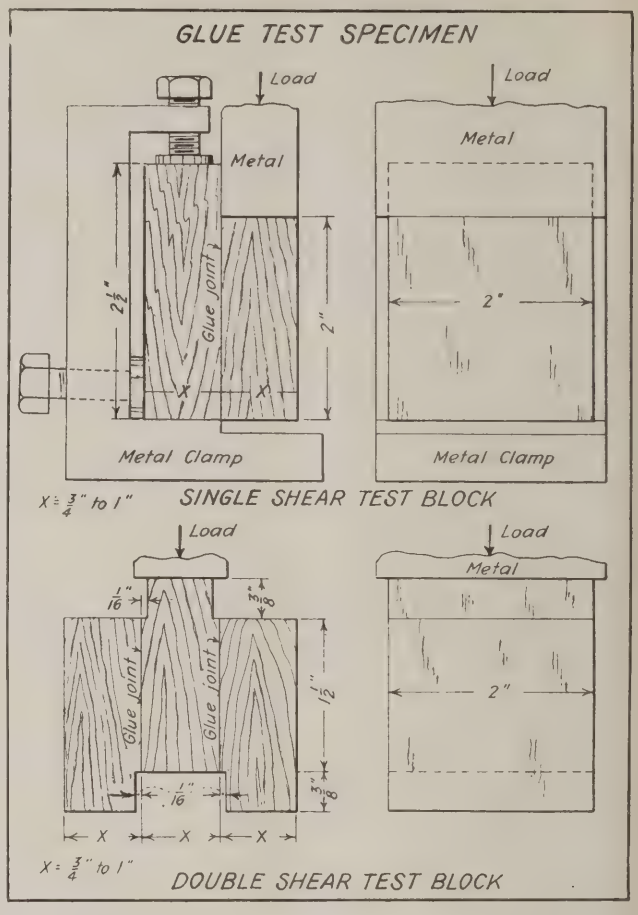
It was understood that a progress report would be forthcoming, but none was received.

Machine Gun Mounting

There was no committee on this subject. It is understood, however, that Col. Clark has given this subject much thought and would possibly have something to recommend. It is suggested that Mr. Hanks communicate with Col. Clark and ascertain his wishes.

Marking Control Levers

In view of the rapid development of control devices, it is not deemed wise to restrict design by requiring uniform movements of the levers, consequently it is suggested that "all control levers be marked indicating their purpose and direction of control."



No action was taken, but this will be put to final vote at next Division meeting.

Pipe Fittings, Rubber Tubes

Mr. Tuttle, Chairman of this Committee, handed in his complete final report, which follows:

RUBBER HOSE FOR USE WITH GASOLINE (AERONAUTIC)

Type No. 1.—Rubber Tube

PART I. TECHNICAL

A.—Description

Construction. 1.—The gasoline hose must consist of rubber and cotton constructed in the following manner, and the quality of the finished hose must be uniformly good throughout.

Inner Tube. 2.—An inner tube which is to be made of rubber free from flaws or cracks and of a quality conforming to the conditions laid down in this specification. When of an internal diameter of ¾ inch or less, this inner tube must be seamless. Tubes of larger internal diameter may be made from rubber sheet, in which case they must consist of at least two complete turns.

Cotton Plies. 3.—The cotton shall consist of either braided or canvas plies and shall comply with the following table.

Internal diameter hose	Up to and including ⅝ in.	11/16 inch to 1½ inch.	Greater than 1½ inch.
Number of plies.....	Not less than two.	Not less than three.	Not less than four.

Outer Cover. 4.—An outer cover of rubber of the same quality as that used for the inner tube, and of good workmanship and finish.

Dimension Limit. 5.—The internal diameter of the hose must not vary more than plus or minus 3% of the internal diameter stated on the order.

Length of Hose. 6.—The contractor, when quoting or when acknowledging an order for this class of hose, must state the lengths in which it can be supplied. The hose should be supplied in the maximum lengths possible.

B.—Physical Properties

Flexibility. 7.—By "Flexibility" is meant capacity to bend without kinking.

8.—When hose of internal diameter (y) is bent around a cylinder having a diameter equal to x times the external diameter of the hose, as shown in the following table, the external diameter of the hose must not increase or diminish by more than 10%.

Internal Diameter of Hose (y)	x
Less than ½ inch.....	8
½ inch to ¾ inch.....	12
13/16 inch to 1⅛ inch.....	14
Above 1⅛ inch.....	16

9.—The hose, after having been filled with gasoline for two hours, must withstand a minimum internal hydraulic pressure of P pounds per square inch, depending upon the internal diameter (D) of the hose without showing defects.

D—Internal Diameter in inches.	Minimum Pressure in pounds per sq. inch (P)
Up to ½ inclusive	160
9/16 to 1 "	140
1 1/16 to 1½ "	120
1 9/16 to 2 "	100
Above 2 "	80

C.—Chemical Properties

Rubber. 10.—No organic matter other than Para or Plantation Rubber shall be used in the preparation of this hose.

11.—The percentage of rubber shall not be less than 32%.

12.—The amount of free sulphur in either the tube or the cover shall not exceed 1%.

Dry Heat Test. 13.—A three-inch piece of the hose, after having been placed in an air oven at 132°C. for 2 hours, must show, when cool, no tendency to crack, and must not be tacky.

Permeability to Gasoline Test. 14.—(The Specific Gravity of the gasoline used in this test should be between 0.710 and 0.725 at 60°F.; 65% of it must distill at over 100°C. from a distillation flask when the bulb of the thermometer is just below the side tube.) A 14" length of the hose is held vertically and plugged at the bottom. The upper end is fitted with a glass tube about 18" long. The hose so arranged is filled with gasoline to a head of 12" above the top of the acting length of the hose. The acting length of the rubber hose is 12". The upper end of the glass tube is loosely closed with a cork.

15.—During the first 24 hours the level of the gasoline will fall comparatively rapidly. The loss of gasoline is made good by frequent additions from a known volume of gasoline, care being taken that the level of the gasoline in the glass tube does not fall at any time by more than three inches. The test is to last for 72 hours, and the loss of gasoline during the third 24 hours must not exceed 100 cc. per square foot of the original internal surface of the hose.

Immersion in Gasoline. 16.—A three-inch piece of the hose is boiled for one hour (using a reflux condenser) in gasoline similar to that used for the Permeability Test. The gasoline is allowed to cool down. Twenty-four hours later the test piece is removed from the gasoline and examined without delay, as follows:

17.—The internal diameter at the point of greatest constriction is measured by means of rod gauges. From this measurement the area of the bore is calculated. It must not differ from the original by more than 25%.

18.—The test piece is then cut longitudinally into halves, and the adhesion between rubber and cotton carefully examined. The adhesion must be of such a character that the rubber can only be stripped from the cotton by hand with difficulty.

Immersion in Oil 19.—A three-inch piece of the hose is immersed in Vacuum "A" or other oil (approved by Purchasing Office) at a temperature of 100°C. for 8 hours, and for a further period of 24 hours at ordinary temperature. The oil is then wiped from the surface of the hose. The decrease of internal diameter shall be less than 10%.

20.—The flexibility and elasticity of the rubber must not be diminished and there must be no tendency of the rubber to separate from the cotton.

PART II. INSPECTION

Test Pieces. 21.—The purchaser will decide where the tests are to be carried out. All test specimens are to be cut in the presence of the inspector and they are to be marked as he may direct.

22.—For the purpose of testing, a representative sample will be cut from each 1,000 feet of hose or fraction thereof, and the tests will proceed in accordance with the Purchasing Office's instructions.

Rejections. 23.—If any sample fails to comply with any of the above tests, the hose represented thereby will be rejected.

Marking. 24.—Accepted and Rejected material must be marked as directed by the Inspector.

PART III. SPECIAL CONDITIONS

Depreciation. 25.—The contractor must bear the cost of the depreciation in value of any rejected material due to test pieces being cut therefrom.

Rejected Material. 26.—The Contractor must not supply any material which has previously been rejected by any Government Department, without giving full written particulars of the previous rejection to the Inspector who is inspecting to this Specification.

"This practice has been recommended by the Aeronautic Division of the S. A. E. in co-operation with representatives of the U. S. War and Navy Departments.

If for any reason your requirements cannot be brought into harmony with this practice please notify promptly, the Society of Automotive Engineers (29 West 39th Street, New York City), returning this sheet with comments thereon.

The practice recommended represents the conseusus of opinion of the advising engineers as of October 29th, 1917."

Discussion

In the general discussion which followed, Mr. Tuttle advised that both specifications Nos. 1 and 2 were in shape so that they could be released to the rubber manufacturers, and that he believed the rubber tubing made under this specification was superior to metal tubing now in use. He also advised that the Goodyear Tire & Rubber Company has a half dozen 50 foot lengths of this tubing and that some of the Canadian Airplane Companies' machines were being equipped with a similar tubing made by the Goodyear Company. Production could be started, in all probability within a few days after the placing of orders.

Mr. Tuttle further advised that the Goodrich Company promised to make up a number 50 foot lengths to be sent out for test and that if this could be placed on some of the machines that are actually in service, a good practical test could be obtained.

Mr. Hanks advised that Col. V. E. Clark was no doubt interested in this product and that he would be glad to communicate with him.

It was moved, seconded and carried that the specification as read be accepted and that copies of the specifications be promptly sent to interested manufacturers.

RUBBER HOSE FOR USE WITH GASOLINE (AERONAUTIC)

Type No. 2.—Cotton Inside Reinforced with Wire

PART I. TECHNICAL

A.—Description

Construction. 1.—The gasoline hose must consist of rubber and cotton constructed in the following manner, and the quality of the finished hose must be uniformly good throughout.

Inner Tube. 2.—The inner tube shall consist of a canvas tube supported by a helix of oil tempered steel wire of not less than .020 inch diameter, spaced not less than five turns per inch. The rubber tube shall be placed between this inner cotton tube and the cotton plies specified below.

Cotton Plies. 3.—The cotton shall consist of either braided or canvas plies and shall comply with the following table. The inner cotton tube shall not be considered one of the plies specified.

Internal diameter hose	Up to and including 5/8 in.	11/16 inch to 1½ inch.	Greater than 1½ inch.
Number of plies	Not less than two.	Not less than three.	Not less than four.

Outer Cover. 4.—An outer cover of rubber of the same quality as that used for the inner tube, and of good workmanship and finish.

Dimension Limit. 5.—The internal diameter of the hose must not vary more than plus or minus 3% of the internal diameter stated on the order.

Length of Hose. 6.—The contractor, when quoting or when acknowledging an order for this class of hose, must state the lengths in which it can be supplied. The hose should be supplied in the maximum lengths possible.

B.—Physical Properties

Flexibility. 7.—By "Flexibility" is meant capacity to bend without kinking.

8.—When hose of internal diameter (y) is bent around a cylinder having a diameter equal to x times the external diameter of the hose, as shown in the following table, the external diameter of the hose must not increase or diminish by more than 10%.

Internal Diameter of Hose (y)	x
Less than ½ inch	8
½ inch to ¾ inch	12
13/16 inch to 1⅛ inch	14
Above 1⅛ inch	16

9.—The hose, after having been filled with gasoline for two hours, must withstand a minimum internal hydraulic pressure of P pounds per square inch, depending upon the internal diameter (D) of the hose without showing defects.

D—Internal Diameter in inches.	Minimum Pressure in pounds per sq. inch (P)
Up to ½ inclusive	160
9/16 to 1 "	140
1 1/16 to 1½ "	120
1 9/16 to 2 "	100
Above 2 "	80

C.—Chemical Properties

Rubber. 10.—No organic matter other than Para or Plantation Rubber shall be used in the preparation of this hose.

11.—The percentage of rubber shall not be less than 32%.

12.—The amount of free sulphur in either the tube or the cover shall not exceed 1%.

Dry Heat Test. 13.—A three-inch piece of the hose, after having been placed in an air oven at 132°C. for 2 hours, must show, when cool, no tendency to crack, and must not be tacky.

Permeability to Gasoline Test. 14.—(The Specific Gravity of the gasoline used in this test should be between 0.710 and 0.725 at 60°F.; 65% of it must distill at over 100°C. from a distillation flask when the bulb of the thermometer is just below the side tube.) A 14" length of the hose is held vertically and plugged at the bottom. The upper end is fitted with a glass tube about 18" long. The hose so arranged is filled with gasoline to a head of 12" above the top of the acting length of the hose. The acting length of the rubber hose is 12". The upper end of the glass tube is loosely closed with a cork.

15.—During the first 24 hours the level of the gasoline will fall comparatively rapidly. The loss of gasoline is made good by frequent additions from a known volume of gasoline, care being taken that the level of the gasoline in the glass tube does not fall at any time by more than three inches. The test is to last for 72 hours, and the loss of gasoline during the third 24 hours must not exceed 100 cc. per square foot of the original internal surface of the hose.

Immersion in Gasoline. 16.—A three-inch piece of the hose is boiled for one hour (using a reflox condenser) in gasoline similar to that used for the Permeability Test. The gasoline is allowed to cool down. Twenty-four hours later the test piece is removed from the gasoline and examined without delay, as follows:

17.—The internal diameter at the point of greatest constriction is measured by means of rod gauges. From this measurement the area of the bore is calculated. It must not differ from the original by more than 25%.

18.—The test piece is then cut longitudinally into halves, and the adhesion between rubber and cotton carefully examined. The adhesion must be of such a character that the rubber can only be stripped from the cotton by hand with difficulty.

Immersion in Oil. 19.—A three-inch piece of the hose is immersed in "Vacuum A" or other oil (approved by Purchasing Office) at a temperature of 100°C. for 8 hours, and for a further period of 24 hours at ordinary temperature. The oil is then wiped from the surface of the Hose. The decrease of internal diameter shall be less than 10%.

20.—The flexibility and elasticity of the rubber must not be diminished and there must be no tendency of the rubber to separate from the cotton.

PART II. INSPECTION

Test Pieces. 21.—The purchaser will decide where the tests are to be carried out. All test specimens are to be cut in the presence of the inspector and they are to be marked as he may direct.

22.—For the purpose of testing, a representative sample will be cut from each 1000 feet of hose or fraction thereof, and the tests will proceed in accordance with the Purchasing Office's instructions.

Rejections. 23.—If any sample fails to comply with any of the above tests, the hose represented thereby will be rejected.

Marking. 24.—Accepted and rejected material must be marked as directed by the Inspector.

PART III. SPECIAL CONDITIONS

Depreciation 25.—The Contractor must bear the cost of the depreciation in value of any rejected material due to test pieces being cut therefrom.

Rejected Material. 26.—The Contractor must not supply any material which has previously been rejected by any Government Department, without giving full written particulars of the previous rejection to the inspector who is inspecting to this specification.

"This practice has been recommended by the Aeronautic Division of the S. A. E. in co-operation with representatives of the U. S. War and Navy Departments.

If for any reason your requirements cannot be brought into harmony with this practice please notify promptly the Society of Automotive Engineers (29 West 39th Street, New York City), returning this sheet with comments thereon.

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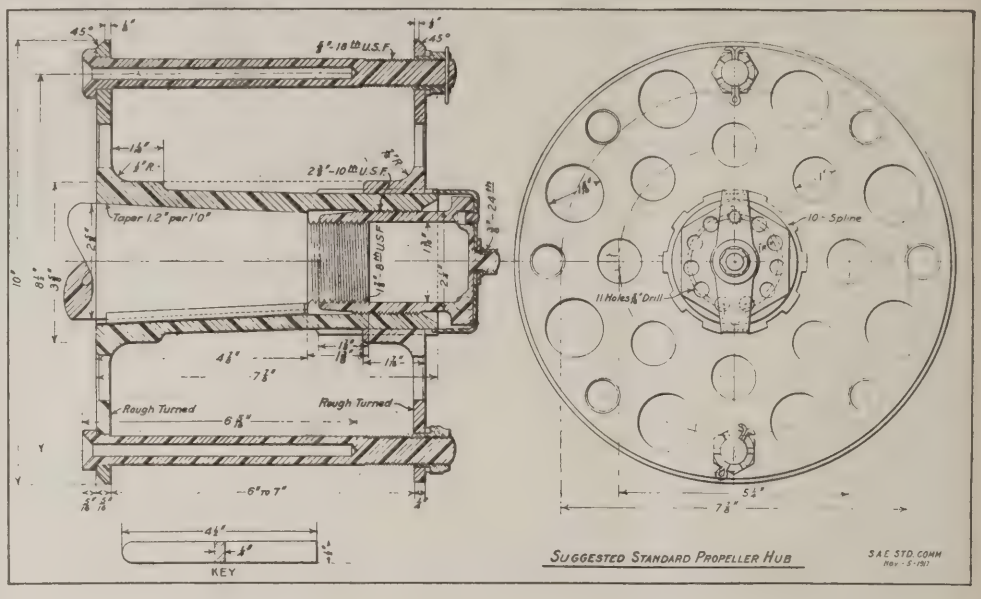
Pipe Fittings, Metal

Mr. Hanks reported that the dope people had sent some steel compression couplings to Dr. Dickinson and that they looked pretty good, especially for the harder grades of tubing and for high pressure.

Pontoon Fittings

Mr. Loening, Chairman of this Committee, wrote under the date of October 22nd, advising that there have been several meetings of the committee and that due to the rapid advancement along these lines it does not seem possible at the present time to give serious consideration to the standardization of Pontoon Fittings. No action taken.

Sometime ago a series of blueprints prepared by Mr. Manly were sent to this committee. It is not certain whether these blueprints were given consideration by Mr. Loening's committee or not.



Propeller Shaft—Ends and Hubs

The sub-division meeting on this subject was held Oct. 30th. There were present: Lieut. Commander, Bureau of Steam Engineering; C. B. King, Signal Corps; F. W. Caldwell, Signal Corps; M. W. Hanks, S. A. E.

The meeting was called to recommend a definite practice for Propeller Shaft-Ends and Hubs.

It was the consensus of opinion of those present that a taper of 1 to 10 should be adopted for all engines, and that the shaft-end for engines up to and including 200 horsepower be according to drawing submitted which is practically the same as the S. A. E. shown on Data Sheet 45, except slight changes in tolerance and the thread changed from 25 mm. pitch to 10 thread U. S. form, as per drawing submitted. This shaft size is now used on the Hispano Suiza engines and a number of other prominent makes.

For engines above 200 horsepower the Mercedes type of shaft-end and hubs was recommended.

Illustrations of these shaft-ends and hubs are presented herewith.

Aeronautic Safety Belts

The object of the meeting of Sub-committee was to recommend a universal type of safety belt and catch for both Army and Navy.

Lieut. Hunsaker previously submitted a type of belt and catch approved by the Navy, and Col. V. E. Clark also recommended a type approved by the Signal Corps.

These two belts, together with two or three other styles, were exhibited and commented on as follows:

Canadian Belt

This belt has a metal clasp bar across the belt in front. One end of the bar is hinged and the other fastens with a clip. Grummits in the belt catch over pins in the hinged bar.

Colonel Goodier and Captain Oker agree that this belt is too hard to reassemble if inadvertently opened.

Italian Head-Belt

This belt is made of soft light green leather and the catch is made like a heavy gaiter buckle. Besides this buckle there are two rows of extra large glove fasteners to hold the belt in event the catch should be inadvertently loosened. To release, the end of the leather is jerked away from the body. This opens the gaiter buckles and releases the glove fasteners.

This belt appeals to Colonel Goodier and Captain Oker very much, but they criticize the difficulty of putting the glove fasteners together and the likelihood of the glove fasteners becoming damaged in service, also that the belt could not be reassembled easily if inadvertently opened.

To obviate the criticism of the glove fasteners, Mr. Hanks suggested replacing them with gaiter buckles similar to the one already used. This plan seemed to appeal to both Colonel Goodier and Captain Oker as it was not likely to be inadvertently released yet could be released instantly by jerking the free end of the belt away from the body. It could also be reasonably easily assembled. It was suggested that Mr. Hanks might arrange for a sample to be made up preferably of fabric in place of leather.

Army Belt

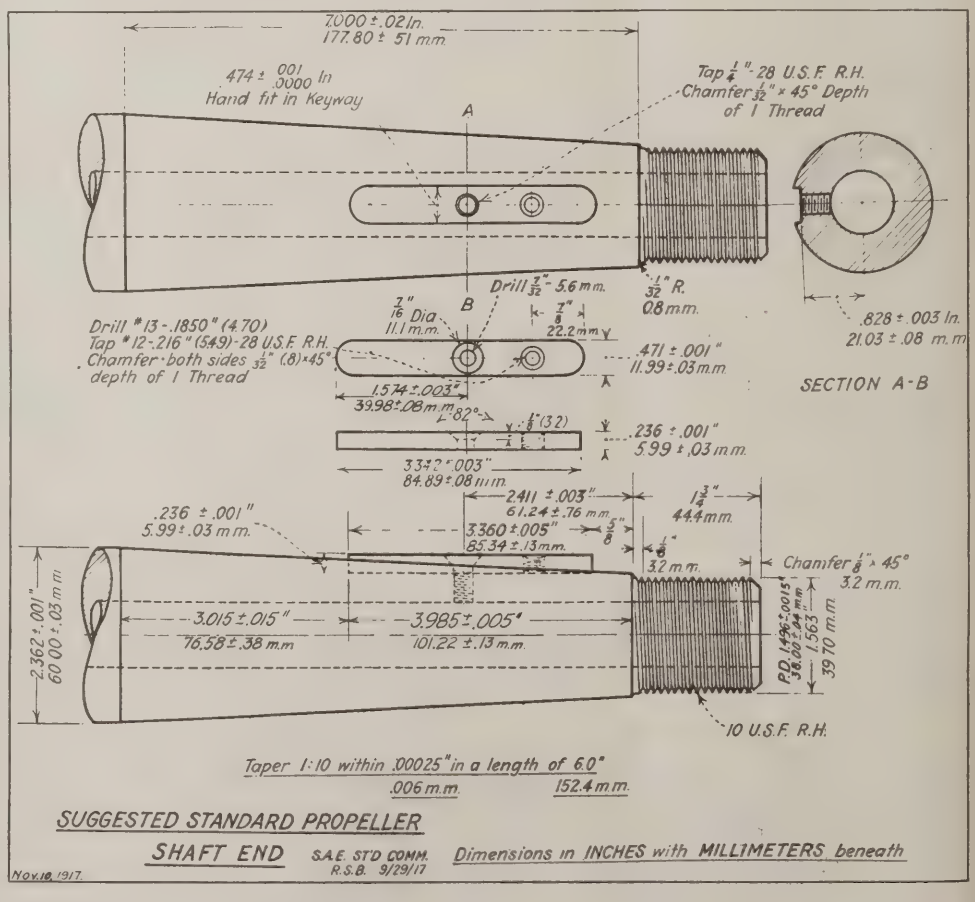
The catch on this belt is of the swing hinge type opened by catching under the hasp and pulling away from the body. The general plan is similar to the Navy belt.

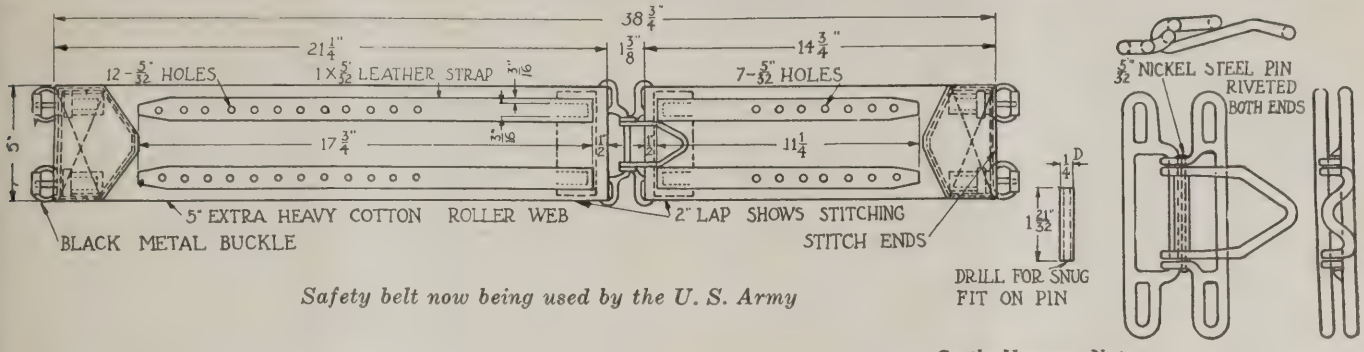
Colonel Goodier advises that this catch is simple, is not easily disengaged and if you do inadvertently open it, it is pretty easy to reassemble. In general, the belt is very satisfactory.

Both Colonel Goodier and Captain Oken were of the opinion that the Army clasp could be improved upon by designing it so the clasp would not get out of place. The Navy clasp was somewhat better from this standpoint but even that did not give all that was to be desired.

Clark Catch

This catch is similar to a buckle except that it has two prongs spaced about two inches apart and is released by pulling a cord which rotates the keybar, allowing the buckle catches to drop through and release the belt.





Safety belt now being used by the U. S. Army

Colonel Goodier mentioned that it is not as easy to put this belt on as the Army type, as the buckle catches must be definitely located in the belt holes, also if released would not be easily reassembled. Capt. Oker was of the same opinion.

Navy Belt

The catch on this belt is of the swing hinge type opened by catching under the hasp and pulling away from the body.

The width of the hinge portion is longer than in the Army belt and is not as likely to catch in the wrong position.

Colonel Goodier points out that the catch is very similar to the Army belt but that it is very difficult to open with heavily mitted hand. This, however, could be easily changed by raising the catch section of the clasp. In general it would seem that this belt was intended to go around the body more than over the knees and thighs. It seems to be practice of the Army to use the belt around the thighs rather than around the body.

Captain Oker pointed out that it was practically impossible to adjust the belt from the seat and it was very essential in long flights to have freedom but when in action and quick manoeuvring was necessary, it was of the utmost importance to be strapped in tight and for this reason the belt should be easily adjusted for tightness. It will be impossible to tighten this belt after you once started in flight if you found it was too loose.

In view of the above comments, it appears that there is no belt and catch that is entirely agreeable to both Army and Navy. However, in view of the fact that in general the catches are much the same it is not improbable that some one will design a catch and plan of belt tightening that will be mutually agreeable.

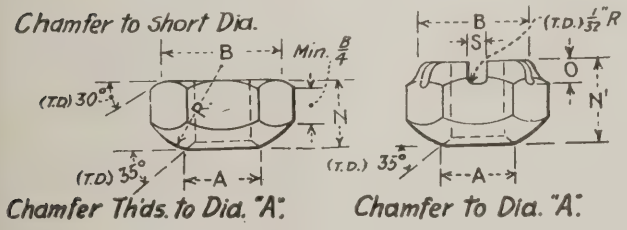
Final decision will have to await a mutually satisfactory design.

Screws and Bolts

Mr. Ehrman, Chairman, offered the following recommendations for S.A.E. fine threads from ¼ in. to 1½ in. inclusive:

Ball Hexagon Nuts

S.A.E. Recommended Aeronautic Practice.



Size A and Th'ds. per Inch.	Ball Hexagon. B	N	R	Ball Castle. B	N′	S	O
.164 (No. 8)—32	.375	.172	.375	.375	.250	.078	.078
.190 (No. 10)—32	.375	.172	.375	.375	.250	.078	.078
.216 (No. 12)—32	.438	.172	.375	.438	.266	.078	.094
.250 (¼")—28	.438	.203	.375	.438	.297	.078	.094
.313 (5/16")—24	.500	.250	.375	.500	.344	.078	.093
.375 (⅜")—24	.563	.313	.500	.563	.438	.125	.125
.438 (7/16")—20	.686	.359	.500	.688	.484	.125	.125
.500 (½")—20	.750	.375	.500	.750	.563	.125	.188
†.563 (9/16")—18	.875	.469	.625	.875	.656	.156	.188
†.625 (⅝")—18	.938	.516	.625	.938	.766	.156	.250

All Threads U. S. Form. N′ = N + O. A = Size of Bolt.
Dimensions in Inches B = Also Size of Hexagon. † Future Sizes.

"This practice has been recommended by the Aeronautic Division of the S.A.E. in cooperation with representatives of International Aircraft Standard Board and British Aircraft Inspection Department.

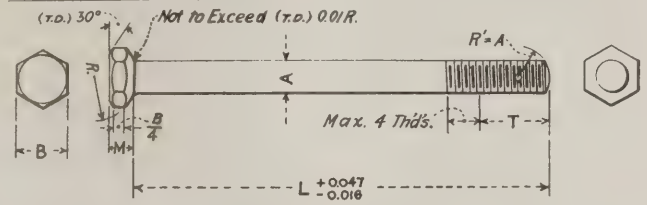
If for any reason your requirements cannot be brought into harmony with this practice please notify promptly the Society of Automotive Engineers, 29 West 39th Street, New York City, returning this sheet with comments thereon.

The practice recommended represents the consensus of opinion of the advising engineers as of November 1, 1917."

Castle Hexagon Nuts

S.A.E. Recommended Aeronautic Practice.

Size A and Th'ds. per Inch.	B	N	S	O	M	L	R
.164 (No. 8)—32	.375	.234	.078	.078	.156	.016	.094
.190 (No. 10)—32	.375	.250	.078	.078	.172	.016	.094
.216 (No. 12)—32	.438	.265	.078	.093	.172	.031	.094
.250 (¼")—28	.438	.281	.078	.093	.188	.031	.094
.313 (5/16")—24	.500	.328	.078	.093	.234	.031	.094
.375 (⅜")—24	.563	.406	.125	.125	.281	.031	.094
.438 (7/16")—20	.688	.453	.125	.125	.328	.047	.125
.500 (½")—20	.750	.562	.125	.187	.375	.047	.125
†.563 (9/16")—18	.875	.609	.156	.187	.422	.047	.156
†.625 (⅝")—18	.938	.718	.156	.250	.469	.047	.156

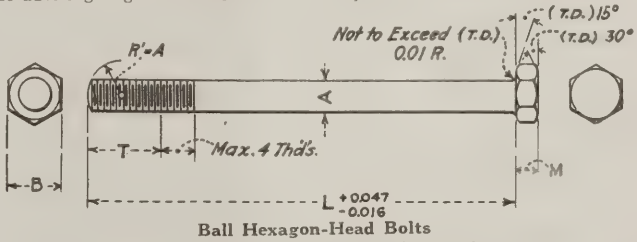


A = Size of Bolt. B=Also Size of Hexagon. † Future Sizes
All Threads U. S. Form O=Also Depth of Slot.
T.D.—Tooling Dimensions.
Dimensions in Inches.

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Ball Hexagon-Head Bolts

S.A.E. Recommended Aeronautic Practice.
T = Min. Length of Usable Thread.

Bolts, Size A Th'ds. per Inch.	*Limits A	B	M	R
.164 (No. 8)—32	0.164 0.160	.313 (5/16)	.172	.375
.190 (No. 10)—32	0.190 0.186	.375 (⅜)	.172	.375
.216 (No. 12)—32	0.216 0.212	.375 (⅜)	.172	.375
.250 (¼")—28	0.250 0.246	.438 (7/16)	.203	.375
.313 (5/16")—24	0.313 0.309	.500 (½)	.250	.375
.375 (⅜")—24	0.375 0.371	.563 (9/16)	.313	.500
.438 (7/16")—20	0.438 0.434	.688 (11/16)	.359	.500
.500 (½")—20	0.500 0.496	.750 (¾)	.375	.500
†.563 (9/16")—18	0.563 0.558	.875 (⅞)	.469	.625
†.625 (⅝")—18	0.625 0.620	.938 (15/16)	.516	.625

When body length L =	½"	⅝"	¾"	⅞"	1 "	Over 1"
Length of thread T =	⅜"	7/16"	½"	½"	½"	¾"

All threads U. S. Form. Dimension in Inches. † Future sizes.
*Finished size including plating or rust preventing treatment when used. Bureau of Standards recommend .001" as thickness of plating for rust prevention.

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Plain Hexagon-Head Bolts

S.A.E. Recommended Aeronautic Practice.

T = Min. Length of Usable Thread. $M = \frac{A}{2} + \frac{1''}{32}$

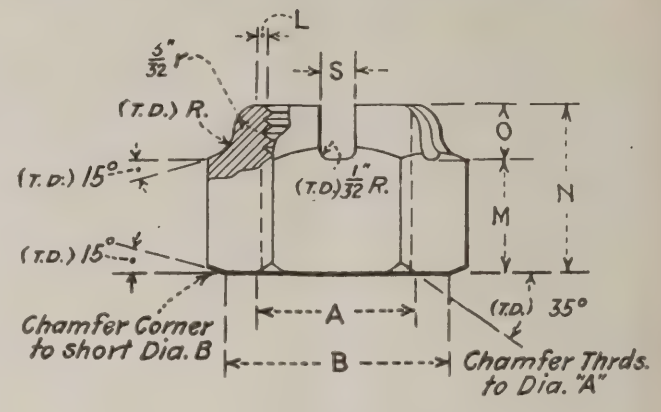
Bolts, Size A Th'ds. per Inch.	*Limits A	B	M
.164 (No. 8)—32	0.164 0.160	.313 (5/16)	.125
.190 (No. 10)—32	0.190 0.186	.375 (3/8)	.125
.216 (No. 12)—32	0.216 0.212	.375 (3/8)	.125
.250 (1/4")—28	0.250 0.246	.438 (7/16)	.156
.313 (5/16")—24	0.313 0.309	.500 (1/2)	.188
.375 (3/8")—24	0.375 0.371	.563 (9/16)	.219
.438 (7/16")—20	0.438 0.434	.688 (11/16)	.250
.500 (1/2")—20	0.500 0.496	.750 (3/4)	.281
†.563 (9/16")—18	0.563 0.558	.875 (7/8)	.313
†.625 (5/8")—18	0.625 0.620	.938 (15/16)	.344
When body length L =	1/2"	5/8"	3/4"	7/8"	1"	Over 1"
Length of thread T =	3/8"	7/16"	1/2"	1/2"	1/2"	3/4"

All threads U. S. Form. Dimensions in Inches.
T. D. = Tooling Dimension. † Future sizes.
*Finished size including plating or rust preventing when used. Bureau of Standards recommend .001" as thickness of plating for rust prevention.

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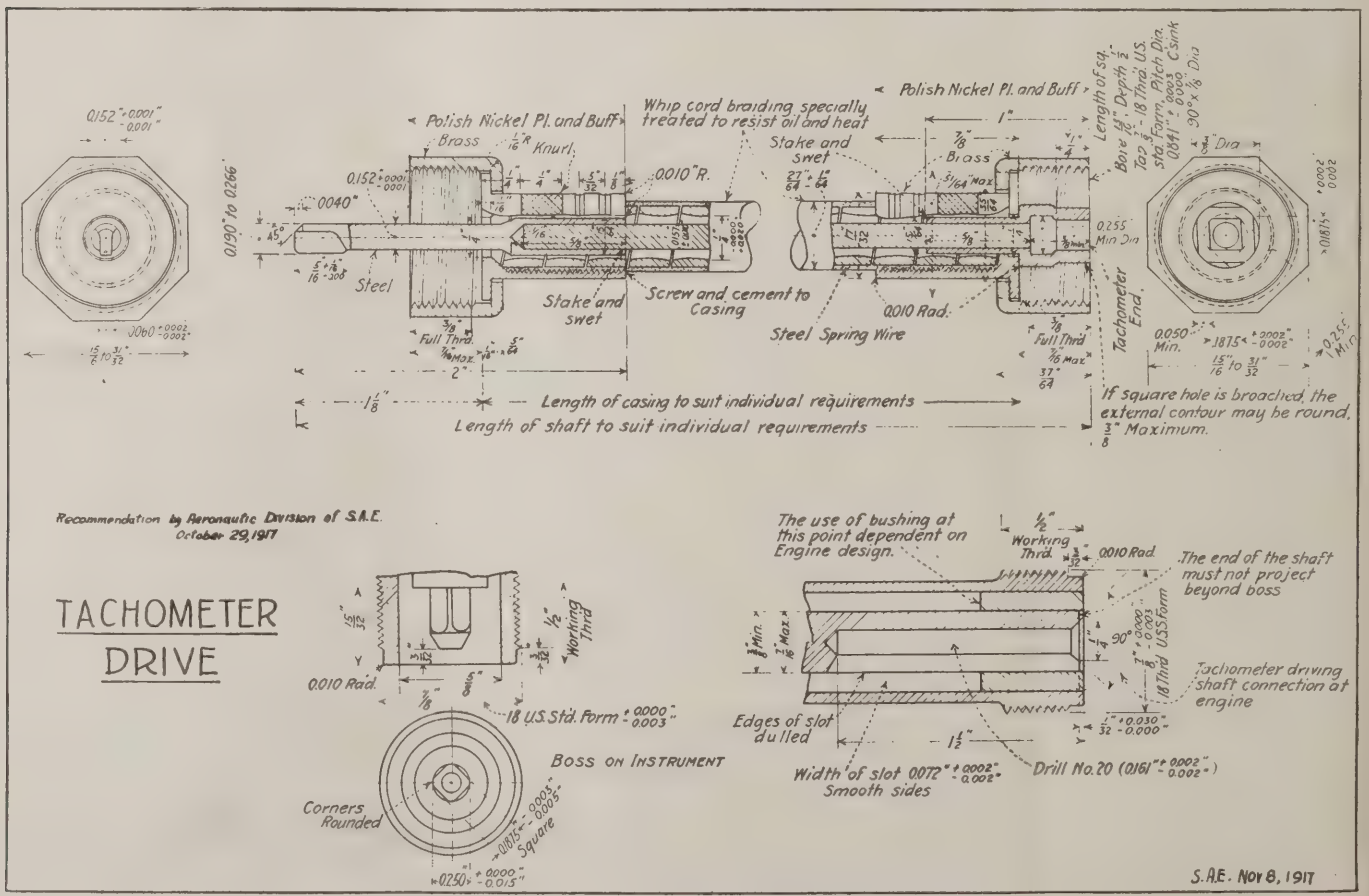
Spark Plug Shells

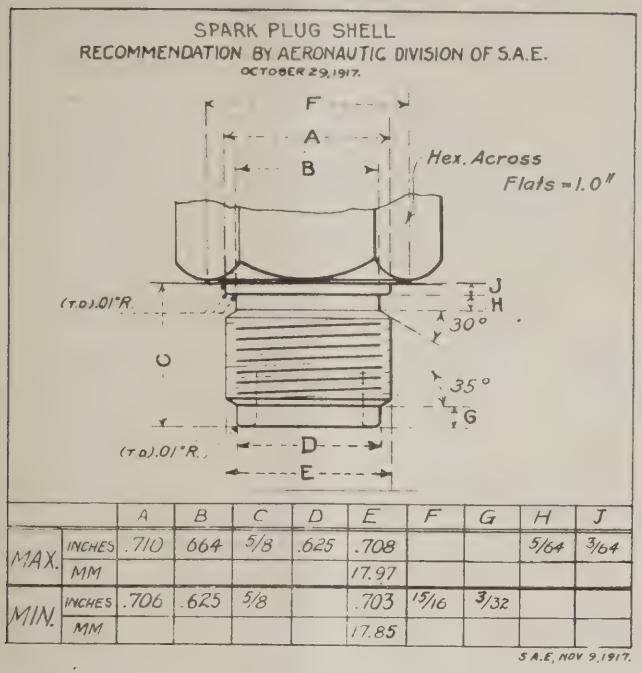
At various times during the past few years, Committees have met in an endeavor to complete the work of standardizing the spark plug shell. The S.A.E. issued in May, 1917 a revised Data Sheet for the 7/8 and 1 3/8" hex size spark plug shell. The growing demand for the meteric plug has made it necessary to give the meteric thread serious consideration for standard.

After a careful investigation, the Aeronautic Division unanimously adopted the 18 mm. plug 1½ mm. pitch, but could not at that time determine upon the size of hex, washer space or thread chamfer. A committee was appointed some four weeks ago to give serious consideration to these three points, with the result that Mr. Roche, Chairman of this Sub-committee on Spark Plug Shells has a report which indicates that these points have been satisfactorily cleared up. Final report approved and attached.

There was considerable discussion on the thread tolerance recommended by the British Engineering Society. At first sight, these tolerances seemed to be too liberal, but on careful review and investigation, it was the consensus of opinion that if all manufacturers worked within these limits, and if these limits exceeded the plugs should be rejected, that the tolerance would be satisfactory from a commercial standpoint.

On motion by Mr. Libby, seconded by Mr. Ehrman, the spark plug shell report was accepted.





		A	B	C	D	E	F	G	H	J
MAX.	INCHES	.710	.664	5/8	.625	.708			5/64	3/64
	MM					17.97				
MIN.	INCHES	.706	.625	5/8		.703	15/16	3/32		
	MM					17.85				

S.A.E. NOV 9, 1917.

Spark Plug Tolerances

A table of tolerance for 18 mm. spark plug threads as reported to have been adopted by the (British) Engineering Standard Committee was presented, as follows:

DIMENSIONS OF SPARK-PLUG THREAD

DIAMETER	MAXIMUM			MINIMUM		
	Mm.	Inches		Mm.	Inches	
Outside	17.975	0.70768	(0.708)	17.850	0.70275	(0.703)
Pitch	17.001	0.66933	(0.669)	16.876	0.66441	(0.664)
Root	15.764	0.62457	(0.625)	15.739	0.61964	(0.620)

DIMENSIONS OF TAPPED HOLE

DIAMETER	MAXIMUM			MINIMUM		
	Mm.	Inches		Mm.	Inches	
Outside	18.325	0.72146	(0.721)	18.187	0.71603	(0.716)
Pitch	17.176	0.67622	(0.676)	17.051	0.67124	(0.671)
Root	16.201	0.63783	(0.638)	16.076	0.63291	(0.633)

Tachometer Drive

The Committee on Tachometer Drive submitted the following recommendations:

(1) The upper or instrument end of the shaft has a squared socket, made integral with a shoulder which forms a thrust bearing.

(2) The lower or engine end is finished with a cylindrical end with a single integral key.

(3) The casing is to be of flexible metallic tubing, covered with whip cord braid and impregnated to prevent oil leakage; similar to sample, or covered with other material which will be equally flexible, oil tight and free from stretching and of no greater weight than the whipcord braid covering casing. The outside diameter of casing to be over braid to be approximately 7/16"; the inside diameter of casing to be approximately ¼". The ends of the casing are finished alike, as shown in detailed sketches. The screw-threaded sockets covering the whipcord braid are screwed in place and set with shellac or other suitable material to form an oil-tight and permanent connection.

(4) The shaft end at the engine is drilled and slotted to fit the tachometer shaft end, allowing for end-play of at least one inch. More play than this may be required where the drive shaft is more than six feet in length, the amount to be determined experimentally.

(5) Drive Shaft to be of helical wire wound construction, with core wires.

(6) The tachometer spindle is finished square to fit the square socket on the drive shaft.

(7) Drive shaft will rotate at one-half crank shaft speed.

(8) Size and contour of exterior circumference of end nuts optional, but 15/16 octagon recommended.

(9) Dimensions and details are given on accompanying drawing.

(*Continued from page 419*)

The following named officers, Infantry Officers' Reserve Corps, will comply with the following orders: Second Lieut. Howard B. Hull, to report to commanding officer, Ellington Field, Houston, Texas; Second Lieut. Edmund A. Clune, to Kelly Field, San Antonio, Texas; Second Lieut. Arthur F. Woodies, to Rockwell Field, San Diego, California; Second Lieut. George F. Eaton, to Selfridge Field, Mount Clemens, Michigan, for temporary duty and upon completion to proceed to Grestner Field; Second Lieut. Forrest S. Emery, to Chanute Field, Rantoul, Ill.; Frederick A. Frothingham, to Scott Field, Bellville, Illinois; Second Lieut. Newton S. Estabrook, to Wilbur Wright Field, Fairfield, Ohio.

The following named officers, S.O.R.C., to Signal Corps training camp, Fort Leavenworth, Kansas, for a course of instruction: First Lieut. Leroy E. Garwood, First Lieut. James E. Helping, First Lieut. Samuel H. Miller.

The following named officers, S.O.R.C., to Signal Corps training camp, Fort Leavenworth, Kansas, for a course of instructions: First Lieut. Ray B. Blanchard, First Lieut. Roy E. Delay.

A board of officers to consist of Col. Henry H. Arnold, junior military aviator, Signal Corps; Lieut. Col. John F. Curry, junior military aviator, Signal Corps; Major Thurman H. Bane, junior military aviator, Signal Corps, and Major Edward G. Seibert, Medical Reserve Corps, is appointed to meet at Washington, D. C., at the call of the senior member of the board for the purpose of examining such officers as may appear before the board to determine their fitness for rating as military aviators or junior military aviators.

Aviation Officers Assigned

Capt. Hiram S. Brown, Aviation Section, Signal Officers Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army.

First Lieut. Merion C. Cooper, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will report to the commanding officer, aviation concentration camp and supply depot, Garden City, Long Island, N. Y.

Thirty-Seven Enter the Aviation Corps

Thirty-seven student officers at Fort Meyer last week were given commissions in the aviation branch of the signal corps and were sworn in before the commanding officers. The names of the new officers, with their rank and destination, are withheld by the War Department.

The signal corps is in urgent need of men and officers, and it is believed that many others from Fort Myer wil be assigned to this branch of service.

Washingtonian Falls 1,500 Feet in an Aeroplane

George V. Seibold, who is a first lieutenant in the 22nd United States Aero Squadron, at Camp Hicks, Fort Worth, Texas, was hurt in a fall of 1,500 feet with his aeroplane last week, according to a telegram received by his parents. Details of the accident were not stated in the message, and the extent of his inujries is not known.

Extracts from Special Orders 258

Capt. Edward G. Lowry, S. R. C., to Chief War College, for assignment.

Capt. Nicholas M. Kreamer, and First Lieut. Wm. A. Coleman, Av. Sec. S. R. C., to Camp Alfred Vail, Little Silver, N. J.

First Lieut. Harry D. Baird, Av. Sec. S. R. C., to Army Balloon School, Fort Omaha, Nebraska.

Capt. Joseph H. Bean, Signal Corps, to Chief Signal Officer of the Army for assignment to duty.

Second Lieut. Louis C. Kenney, Av. Sec. S. R. C., to the Chief Signal Officer of the Army for assignment to duty.

Second Lieut. Robert B. Rhoads, Av. Sec. S. R. C., to Garden City, Long Island, New York.

First Lieut. George A. Washington, Av. Sec. S. R. C., to the Chief Signal Officer of the Army for assignment to duty.

Major Chauncey St. C. McNeill, Signal Corps, to command of school of Military Aeronautics, Atlanta, Georgia.

The following named officers, Av. Sec. S. R. C., to Garden City, Long Island, New York for assignment to duty: First Lieuts. Norman H. Langley, Dudley H. Manchester, Wm. A. Munn, and Harold H. Tittmann, Sr.

The following named officers, Av. Sec. S. R. C., to Kelly Field, South San Antonio, Texas: First Lieut. Harold Engelbrekt, First Lieut. Philip E. Langworthy, First Lieut. Wm. G. Perry, Second Lieut. Mitchell Allen, Second Lieut. Samuel A. Lovel, Jr.

First Lieuts. Andrew R. Shiland, and Wm. S. Reyburn, Av. Sec. S. R. C., to Hazelhurst Field, Mineola, Long Island, New York for duty.

First Lieuts. Henry H. Hardwig, and John C. Handy, Av. Sec. S. O. R. C., to the Chief Signal Officer of the Army for assignment to duty.

Major Wm. H. Shutam, temporary duty at Kelly Field, South San Antonio, Texas, and upon completion to proceed to Garden City, Long Island, New York.

Colonel Henry H. Arnold, junior military aviator, Signal Corps, is relieved from duty as member of board for the purpose of examining officers to determine their fitness for rating as military aviators or as junior military aviators to which he was appointed by special order, War Department, November 3, 1917.

Assigned to Aviation Duty

The following-named officers, Aviation Section, Signal Officers' Reserve Corps, are assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report to the commanding officer, aviation concentration camp and supply depot, that place, for duty: First Lieuts. Gordon Allen, George Guppy, J. Lovell Little, Alexander R. Manson, Lyman S. McConnell, Lewis J. Newman, Edward G. Tourison, Oscar V. Vatet and Marion S. Wyeth; Second Lieuts. Edward P. Chrystie, Francis J. Creamer, Joseph I. Dise, Ralph Earle, Edwin H. Finken, Frank L. O'Connell, Oliver E. Reagan, Ralph E. Schenck, Edward H. Shea, and William T. Sturges.

Capt. Clayton E. Emig, Aviation Section, Signal Officers' Reserve Corps, is assigned to active duty and will proceed to Middletown, Pa., and report in person to the commanding officer, Signal Corps supply depot, that place, for assignment to duty.

First Lieuts. Neal Creighton and Fred S. Dunn, Jr., Aviation Section, Signal Officers' Reserve Corps, are assigned to active duty and will report to the commanding officer of the balloon detachment, Fort Monroe, Va., for duty.

FELT IN AIRCRAFT CONSTRUCTION

By S. W. WIDNEY, *
President of the Advance Felt Specialty & Cutting Company, Chicago.

THE general knowledge of Felt is not at all in proportion to its general use.

The average farmer, doctor, lawyer, clerk or artisan knows little about Felt and its various uses; notwithstanding he wears a Felt hat, and probably a Felt strip inside of its sweat band to make it fit and feel better on his head.

He has Felt padding in his coat—what would a well tailored coat be without a Felt padding in and about the shoulders?

He has Felt in his shoes—the heels of over 90% of the shoes worn, have a small Felt pad which acts as a cushion and covers up the rough leather without which there would be many very sore heels.

So much for the most common uses of Felt in connection with the average person's apparel.

Its Mechanical Uses

Felt, as a material used for mechanical purposes, is very common and extremely diverse.

Cushions—To relieve jar and eliminate noise. To cover up rough surfaces. To go between two metals—one or either of which has a rough surface. Used in this manner, it is called a "gasket"—thus eliminating the necessity of machining the surface they cover or go between.

Felt for lubrication, is very common. The best oil wicks for feeding oil to both high and low speed bearings, are made of Felt.

Felt for oil retention in bearings, as well as dirt and dust exclusion from oil bearings, is almost universally used.

Used for Elimination of Vibration

The use of Felt for the elimination of noises or rattles has grown wonderfully the last few years. Up to a few years ago rubber was most commonly used, but experience proved that rubber invariably lost its original cushion qualities or resiliency, and after a short time became dead—got hard and non-elastic—with the result, it did not function at all.

Felt for mechanical purposes of this nature, therefore, is fast supplanting rubber, as it will retain its resiliency forever. Being made of wool, or a large percentage of wool, time works little change in its cushion qualities—while with rubber—a vegetable product, time is sure to work a change.

Take the high grade automobile body builders; they are today using Felt almost exclusively to eliminate noises and rattles in frames and sash. They formerly used rubber, but found after a few years that rubber became dead and non-resilient.

The past year or so has seen many rubber parts supplanted by Felt. Mechanical devices have made it possible to turn out various intricate shapes in Felt; heretofore thought impossible, where it was thought only rubber, which could be moulded into any given shape, could be used.

Great strides are also being made by chemists who are hard at work impregnating Felt with various ingredients so as to make it less susceptible to the action of water, oil and various elements, with which it may come in contact.

Arriving at a Standard

It has been admitted by the purchasing agents of some of our largest institutions, that Felt was the only item they bought from which they had no standard to work. Not until very recently was a testing machine perfected, which will enable a buyer of Felt to specify comprehensively and definitely the density or consistency of the goods he desires, as well as the thickness.

Ever since Felt was made, the density or consistency of the goods has been a matter of human touch, which is only a guess at best and one person's opinion against another, which obviously meant constant arguments between buyer and seller.

A Newly Devised Testing Apparatus

The scleroscope embodied all of the fundamental principles necessary to determine the density of Felt; however, a special machine to meet the special requirements had to be worked out and a standard scale had to be inaugurated, as a base, from which to work.

This equipment has now been perfected and special machines for testing the density or hardness of Felt can now be procured so that the buyer and seller can understand each other in this particular. This marks a big stride towards Felt specification standards.

With regard to the analysis of Felt, instruction sheets which are easily comprehended, are procurable with these machines, showing how to determine density, or hardness along with the thickness of a given piece of Felt; also telling how to determine the percentage of wool and cotton and to reveal the presence of any foreign substance, such as dirt, grit, or other foreign matter. Of course, an expert chemist can go to most any distance he desires in this analysis test. But, an ordinary layman can with these brief instructions, and at a very nominal expense in equipment, test Felt as far as the requirements demand.

*All rights reserved.

Need for Clearer Understanding of Felt

An extensive educational campaign is now being carried on with the users of Felt products with the view of acquainting them with the vast difference in results obtained from different grades of Felt.

Felt varying so widely in its analysis as well as consistency, the buyer or engineer rarely, if ever, is in a position to decide definitely just what analysis or consistency of Felt is best suited for the particular need. Their laboratories usually are able to figure out their requirements on steel, just how much carbon, how much nickel, how much manganese, etc., they must have; but on Felt they *guess*. They want this or that, usually determined by the hardness.

The Different Grades of Felt

Felt is made of wool or wool and cotton—the former is known as "all-wool" Felt and the latter as "cotton mixed" Felt. Some Felts contain 90% wool and 10% cotton. Some 90% cotton and 10% wool.

There are many grades of wool, which may be roughly classed as follows:

Fine Wool—(Virgin Stock) which may be long or short fibre—straight or kinky.

Coarse Wool—(Virgin Stock) which may be long or short fibre, but usually coarse wool is straight and has very little kink in it.

Wool Shoddies—Which are a repossessed stock, from old scrap wool Felt or various wool fabrics. These obviously have less length of staple or fibre to them, than virgin stock, and naturally are not as desirable. Shoddy is used extensively in all cheaper grades of Felt, particularly cotton-mixed Felt.

The grades of cotton used in Felts are not as varied as the wool used and are of much less importance.

Determining the Grade to Use

In the making of Hard Felt, it is necessary to use practically all wool, as cotton cannot be hardened in the Felting or fulling process. When cotton is used with a high percentage of Shoddies, it becomes necessary to use glue sizing to make the Felt hard. Any Felt that is glue sized, no matter what the analysis, when subjected to most any mechanical use, rarely stands up, and in most instances proves unsatisfactory.

If it is soaked in oil, the glue soon is worked out and the fibre has nothing to hold it together, where with an all-wool Felt, hardened or fulled by the shrinking process, commonly used in Felt making, will retain its original hardness indefinitely. Sized Felt should never be used, only after conditions are taken into account and thoroughly understood.

In many cases we find certain Felts being used where another quality, density or thickness would be much more suitable.

For a bumper or cushion, many times we find certain Felt being used that is not at all well adapted as to quality, density or thickness for the particular need.

For Lubrication Purposes

For lubricating purposes, the same situation exists. For instance, for oil wicks, different qualities and densities of Felts should be used, where different conditions exist. An extremely dense Felt with a high percentage of cotton, will not feed heavy oil to a high speed bearing, sufficiently, where it might, if a light oil were used, etc. In other words, where Felt is used in connection with oil lubrication, the quality and density of the Felt best suited for the purpose depends much upon the grade of oil that is used.

Felt for oil retention, around housings, etc., and for dust and dirt exclusion; various problems arise here, that are frequently overlooked by engineers. We often find a cheap quality and very soft Felt being used, that does not function at all properly, and as a result oil fairly oozes out around the bearing soon after the machine is out and in operation. One has to but visit any garage and notice the many automobiles with oil dripping down over their axles—all over the wheels—the transmission or differential. This means that improper Felts have been installed.

(*Continued on page* 442)



MILITARY AERONAUTICS



FIRING AT CAPTIVE BALLOONS AND PROPOSED AIDS IN THE DIRECTION OF FIRE AGAINST AIRCRAFT

(By Lt. ALLAN CYRUS, Royal Swedish Coast Artillery)

ALTHOUGH objects in the air are very much exposed to fire, they have, however, shown themselves difficult to hit, owing to the difficulty of locating them and of determining the elements of sight for the gun. This applies especially to moving objects, airships, and aeroplanes; and also, to a certain extent, to captive balloons.

Several examples are given in which captive balloons, subject to fire, have been able to accomplish their work uninjured. Thus the Siberian Airship Company's balloon, on August 31, 1904, at Liao, succeeded in discovering the Japanese attempt to pass around the Russian right flank with large forces, and compelled Marshall Oyama to make several changes in his dispositions. The same day the balloon was fired on; and although even the first bursts of the projectiles were quite near the gondola, the balloon remained uninjured. At the different ascensions of the Russian balloon during the month of October at Pei-ta-pu, they succeeded several times in locating the position of the enemy's batteries. The balloon was often exposed to artillery fire, but escaped with only a few minor damages to the gas apparatus.

At an exhibition firing in Germany, not long ago, in which a balloon was fired upon at a distance of 5,000 m.—with bursting shrapnel, especially constructed for firing at aircraft, giving two explosions 50 m. from each other—the result was that the balloon was brought down only at the end of the firing (30 shots).

It is considered, however, that a balloon cannot remain up any length of time if it finds itself within 1.5 km. from an enemy's infantry; 5 km. from field artillery; and 6.5 km. from heavy artillery. In order to get quick effect against a captive balloon, it is necessary to obtain at least approximately an idea of the distance. This might be accomplished by measuring with a stereoscopic range-finder—which, however, is seldom done.

The German firing regulations prescribe that the direction to the object, from two or more advanced observers, be plotted on a chart and the distance then be measured on the chart—which method has not proved satisifactory.

Rohne asserts that better results are obtained if the diameter of the balloon is measured in points, in which D=10,000/n, if n is the angle of sight and the actual diameter of the balloon is 10 m. (corresponding to a balloon of 525 cubic meters). Using the same formula for the largest field spherical balloon-diameter 12.4 m., volume 1,000 cubic meters—we would have the greatest error as 24 per cent. This method is evidently not adaptable for oblong dragoon balloons.

Aizier's firing method is noteworthy and can also be used in firing at moving objects. Two pieces, with a wide space between them, fire with the same sight elements at the object, one of the pieces a few seconds before the other. If the burst of the projectile of the right hand piece occurs to the right of the left one, both are minus; if the reverse, both are plus, etc.

Table I

Probability of Hitting, Etc., Firing With 57 m. m. k. M/95 (grkt. M/96 has 85 Bullets)

Dist.	2000 m.			3000 m.			4000 m.		
Distance of Burst	Closeness of the Shrapnel Balls	Hits in the Target Balloon (about 32 cu. meters)	Hits in the Field Balloon (about 525 cu. meters)	Closeness of the Shrapnel Balls	Hits in the Target Balloon (about 32 cu. meters)	Hits in the Field Balloon (about 525 cu. meters)	Closeness of the Shrapnel Balls	Hits in the Target Balloon (about 32 cu. meters)	Hits in the Field Balloon (about 525 cu. meters)
25 m	2	40	85 (160)	1,7	34	85 (135)	1,6	32	85 (128)
50 m	1/2	10	40	1/2,3	8,5	34	1/2,5	8	32
100 m	1/8	2,5	10	1/9	2	8	1/10	2	8
200 m	1/32	1/1, 6	2,5	1/36	0,5	2	1/40	0,5	2
	2,000 m.			2,500 m.			3,000 m.		
Tr.-0/0	—	80	100	—	60	95	—	30	80

Whether the distance to the target is measured or estimated, the firing is often executed with different elevations for the different pieces. According to the Russian firing instructions the observers count and report in order the projectiles that fall short and over, and in that way at once determine the fork (that is, what the range is between two certain shots). The width of the fork is usually taken as 200 to 400 m., depending on the possibilities of observation. In Germany, when a 200 m. fork is formed, two parallel change of 50 m. are employed. With a 400 m. fork the execution firing is carried on—according to the Russian and French firing instructions—with 100 m. variations of range. In Norway they try to obtain a 100 m. fork and then make a variation in the depth of fire of 50 m. from a distance 50 m. short of the minus limit. We also, as is known, form a 400 m. fork and give a depth of fire with 100 m. variations. Here it is suitable to go forward (increase the range) on the 100 range and backward on the 50 range. Using shrapnel that breaks up into but few pieces—which, by the way, are not suitable to fight balloons with—this is really necessary.

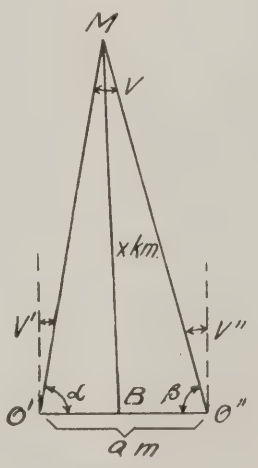


Figure 1

If we, for example, consider that shrapnel closeness of 1/5 is sufficient, which will probably be the case, since each ball makes two holes, this corresponds, according to this table, to a burst distance of a little more than 60 m. During calm weather and with the balloon at a low elevation, one ought to endeavor to obtain a 200 m. fork. In connection with the above, it may be well to mention that while with us the shrapnel bursts are laid 2 and 3 points above the balloon, the French hold the bursts at the height of the balloon's top. The Germans more correctly, if the balloon lies in the descending branch of the trajectory, keep the bursts above the balloon, while if it is in the ascending branch sink it to the same height or even below the balloon.

Observers (spotters) are made use of to a great extent in firing against balloons; these are especially necessary at the greater ranges. In foreign countries, as well as with our own army, use is made of optical signals according to a system agreed upon to transmit the reports of the observations. If such use could be made of the observers (spotters), that through them we would receive correct information as to the distance to the target and the errors in range of the first shots, we would then, with considerably less expenditure of ammunition and time, obtain better results in firing at a balloon than is given by employing the instructions now in force. Immediately occasioned by a firing against a balloon made by me at the last regimental encampment, and remembering the lecture delivered in 1909 by the first instructor of the Coast Artillery School of Fire about the employment of "spotters," I have made an attempt to solve this problem in the following described aids for direction of fire in firing at balloons.

Computing Stick for Determining the Distance to the Target and the Errors in Range in Firing, by the Aid of a "Spotter"

A. Calculations That Form the Basis for the Computing Stick

1. Computations of the distance to the target.

From the battery B (Fig. 1) assume two observers O′ and O″ sent out to observe the target M. In the triangle O′MO″, B is located on or near the base line O′O″. The angles are assumed to be given in points.[1] Since v is the sight angle, from which the base line is seen from M, evidently:

$$x = \frac{a}{v},$$

$$\therefore x = \frac{a}{3150^2 - (\alpha + \beta)} \text{ and}$$

$$\therefore x = \frac{a}{v' + v''}$$

[1] Point = 1/1000 Radian (exactly) or 1/6300 of a circle (approx.).—*Editor.*

[2] 3150 = 1000 × π (approx.).—*Editor.*

From which we obtain the rule: The distance in km. to a certain target is obtained by dividing the distance in meters between the observers by the sum of the complementary angles (expressed in points) to the angles made by the battery and the targent taken by the two observers.

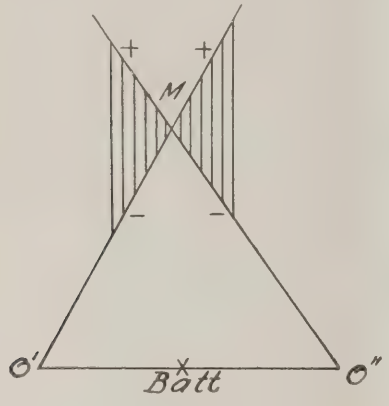


Figure 2

The triangle O'MO" should have as near as possible its two sides (O'M and O"M) of the same length, at least neither of the angles at O' and O" should be obtuse. One observer is evidently enough if the triangle O'MB or BMO" is right angled with the angle at B a right angle.

2. Calculations of the variations in range.

In case the two observers are located one on each side of the firing line and each reports *minus* for shots which fall between (inside) his line of sight and the gun and *plus* for shots which fall on the other side of his line of sight, then evidently two minus reports correspond to a minus (or short) burst (Fig. 2), two plus reports to a plus burst (or an over) and a minus and a plus report to a burst in the ruled portions of the figure. If the side deviation is measured in points and one of the observers reports minus and the other plus, the sign of the burst is the algebraic sum of the two. If this sum equals zero, the burst is at the correct distance.

Regarding the form of the observation triangle, what has been told above in 1 governs.

We assume now that in firing at the target M (Fig. 3) from Battery B a burst has fallen at A for which the observers at O' and O" both report—1. The angle O' is a right angle, BM is 4,000 m. and O'O" is 400 m.

We then have:

$$\angle a = \angle c = 1/3600 \times 360° = 0°3'\ 26''$$

From the Δ MO'O" we have $\angle b = 5°\ 42'\ 38''$

From the Δ AO'O" we have

$$\angle e = 90° - \angle c = 89°\ 56'\ 34''$$
$$\angle f = 90° - \angle (a+b) = 84°\ 13'\ 56''$$
$$\therefore AO' = 3921.3\text{ m} = AB \text{ (about)}$$

But AM = BM − AB (about)
$\therefore$ AM = 78.8, or about 80 m.

The burst was therefore 80 m. short. If this is divided by the algebraic sum of the reports we obtain a quotient of 40. If similar calculations are made, under the same assumptions, but with different locations of burst, and the overs or shorts in meters be divided by the algebraic sum of the reports, we obtain in each case a quotient of about 40. A series of such calculations are recorded in Table II. The four last combinations refer to the case where the sight lines form with the base an isosceles triangle. The rest are calculated with one sight line at right angles with the base. The algebraic sum of the reports is designated by A and the variations in range by X.

Table II

Observations in points from		A	X	X/A	The mean of X/A about
O'	O"		m.		
0	−1	−1	− 39,9	39,9	40
0	+1	+1	+ 40,8	40,8	
0	−4	4	−155,0	38,8	40
0	+4	+4	+168,0	42,0	
−1	−1	2	− 78,8	39,4	40
+1	+1	+2	+ 82,0	41,0	
−4	−4	8	−297,4	37,2	40
+4	+4	+8	+349,2	43,7	
−1	−1	−2	− 79,0	39,5	40
+1	+1	+2	+ 82,	41,0	
−4	−4	−8	−296,0	37,0	40
+4	+4	+8	+348,0	43,5	

Table III

Distance to target	Distance between Observers, m					
	300	400	500	600	700	800
	Constant X/A					
3,000	30	22	18	15	13	11
4,000	53	40	32	27	23	20
5,000	84	63	50	42	36	31

Therefore, if the distance to the target is 4,000 m. and the distance between observers 400 m., the variations in range (over or short) is obtained by multiplying the algebraic sum of the reports by 40.

The value X/A is also shown to be constant for other ranges and other lengths of base O'O", varying with the range and base. A few of these constants are given in Table III.

The above can now be combined into a rule: The variation in range (over or short) of burst in meters of a shot with respect to a target at a known range is equal to the algebraic sum of the side variations in points multipled by a constant that depends on the known distance to the target and the distance between the observers.

B. The Construction of the Computing Stick (Fig. 4)

On the flat plate, which constitutes the principal part of the stick, is a chamfered groove in which there is a sliding ruler. On the plate and ruler, facing each other, are two congruous logarithmic scales.

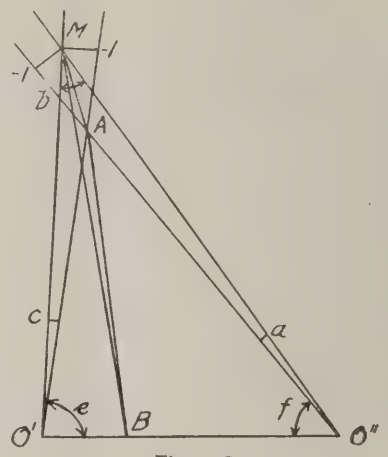


Figure 3

The scale on the plate is marked in hundreds from 100 up to 1500, with the 50's and certain 10's marked also. The scale on the ruler is marked and numbered from 10 to 100 with 5's and even 1's marked and numbered. The ruler has an arm with an edge at right angles to the ruler scale set opposite the number 10 on the ruler, this edge is divided into equal distances from 1500 to 6000 m. with each 100 m. numbered and every 5th marked. On the plate are drawn 10 curves showing the relation between the distance to the object and the constant X/A for each 100 meters of the distance between the observers, from 100 m. to 1000 m. The relation line system's axes are the distance arm's scale and the fixed logarithmic scale, reading to correspond to 1/10 of what the marking gives. On the back of the plate, part of it is divided by lines to serve as a measuring stick, part of it is laid out into a sector divided into points for measuring larger angles, which is done over pins that are put into holes at the center point of the sector and at different points on the arc.

C. The Use of the Computing Stick

1. The determination of the distance.

(*Continued on page* 442)

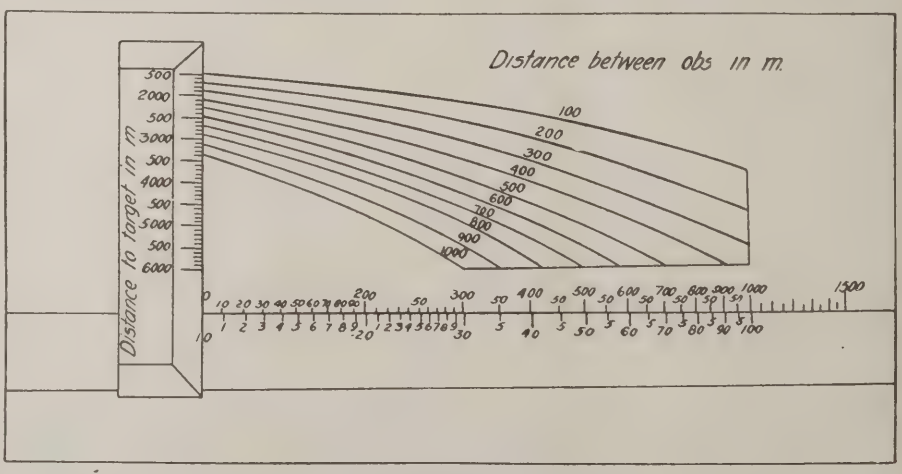


Figure 4. The computing stick, used to determine the distance and the variation in range of the burst

FOREIGN NEWS

BELGIUM

On the night of November 6, bombing raids were carried out by a royal navy air squadron on the following military objectives:—The Thourout (Belgium) railway station and the Lichtervelde railway station and on a moving train near Lichtervelde. Several direct hits on trucks and junctions are reported, but the visibility was said to be poor. Large quantities of explosives were dropped.

On the night of November 6-7 a French bombing escadrille dropped 2,300 kilos of explosives on the stations at Thourout, Cortemarck, Roulers and Lichtervelde. All the objectives were reached.

FRANCE

German aviators on the night of November 9 dropped bombs on a French hospital at Zuydcoote, Department of the Nord, killing seven persons and wounding nine. Dunkirk was again bombarded, six casualties resulting. The following official announcement was made:

"Enemy aviators threw down fifty bombs in the region of Dunkirk. Three persons were killed and three wounded.

"The hospital at Zuydcoote also was attacked by German aviators, who threw down incendiary bombs. Seven persons belonging to the hospital staff were killed and nine were wounded."

Enemy aeroplanes on November 10 bombed French cantonments in the direction of Furness and Loos. Despite rather unfavorable weather, the French aeroplanes have carried out a great many flights, during which two engagements took place.

The fighting airman's race for the higher levels is the logical result of the advantage that is now gained unquestionably by an air position above one's adversary. Time was when the war hawks wheeled their flights below the 5,000-foot air lanes and maneuvered for positions "under the tail" of the enemy birdman. From such position the lower airman could direct a stream of lead upward into the paper-thin belly of the 'plane above him, and most frequently bring it down.

But that was before the development of the aerial acrobats that now put to shame the performances of natives of the upper ether. The superior height now means a distinct advantage of all the speed that gravitation can lend to the high-powered motors, plus the benefit of direction and facilities of aim. In the air these days the man on top is a better man.

The Germans, in an effort to overcome the numerical superiority of the Allies in the air, were the first to carry these flights to the dizzy heights where they are now conducted. With light and powerful climbing machines, equipped with remarkable long range instruments of observation, the German fliers are endeavoring to supply vision to their blinded guns by directed air dashes over the Allies' lines at heights ranging from 20,000 to 23,000 feet, where quick observations might be snatched and carried back to the German lines before the lower flying and slower climbing British fighting 'planes could rise to attack.

In spite of the improvements which the war has brought in the aeroplane the present trend of air fighting involves engagements which tax the skill of the aviators to the utmost. At present the ingenuity of both the German and Allied camps is being heavily taxed to quickly create mechanical contrivances which will give the airman a necessary advantage over his adversary. The necessity of these mechanical advantages is short-lived, because the capture of one of the newly equipped 'planes gives the secret away to the captor, who immediately copies the development or improves upon it to his own greater advantage.

The endurance, both physical and mechanical, of fliers and 'planes that ply the higher levels has mothered inventions to make it easier for the airmen and 'planes to stand the increased labor of high flying. The extreme low temperature of the air four miles above the earth has caused many difficulties.

The fliers have become numbed from cold. Oil in the cooling apparatus on the machine guns even has been congealed, making the weapons useless. German 'planes have been captured in which the machine guns' oil cylinders were bound with strips of asbestos, through which ran fine electrical resistance wires, supplied with a hot current from the dynamos, run by a wind motor on one of the planes. The heat from the charged wires keeps the oil in fluid form and makes the machine gun available for use at any of the higher altitudes.

For some time now the German airmen on observation duty have been declining fight and taking extremely high altitudes. This has necessitated carrying oxygen tanks on their 'planes, from which at frequent intervals they take lung-filling inhalations.

GERMANY

A German report dated November 8 says that "since November 3, the enemy has lost in aerial battles, and by anti-aircraft fire, twenty-four aeroplanes."

In air operations on November 9 the Germans claim to have brought down thirteen hostile machines. British aviators bombarded the big airdromes at Gontrode and St. Denis Westrem and destroyed one German aeroplane and a captive balloon, Haig reports.

GREAT BRITAIN

The British War Office issued the following statement on aerial operations:

"During Wednesday morning, November 7, low clouds and rain considerably hampered the artillery work. In the afternoon, however, weather conditions improved, and some successful artillery and photographic work was carried out by our aeroplanes. Our low flying machines fired many rounds at hostile troops and transports, and in the course of the day a number of bombs were dropped on enemy trenches and billets.

"During the night more than three tons of bombs were dropped on enemy airdromes at Gontrode and St. Denis Westrem and on airdromes in the valley of the River Lys. Railway communications also were bombed and satisfactory results were observed. Few hostile aeroplanes were encountered, but one was driven down out of control. An enemy observation balloon on the ground was destroyed by one of our low-flying machines.

London, Nov. 10.—Twenty German aeroplanes were accounted for in a day of unusual aerial activity on the British front. The "low flying machines," which the British have developed for attacks on infantry did excellent work in conjunction with troops who were making raids on German trenches with good results, according to official announcement from the British War Office, which reads:

"On Thursday (November 8) the weather conditions during the early morning were good for flying. Later in the day, however, aerial work was carried out under considerable difficulties, owing to a strong westerly wind and with heavy clouds and occasional rain.

"A large amount of work was accomplished by our aeroplanes in conjunction with our artillery and a number of photographs were taken. Our low flying machines co-operated in raids carried out by our troops on German trenches and fired many rounds at hostile infantry and machine gun detachments. Numerous bombs were dropped during the day on enemy trenches and billets with good results, but the unfavorable weather prevented bombing by night.

"A very large number of fights took place in the air. Twelve hostile machines were downed, six were driven down out of control and two others were shot down by our anti-aircraft guns. Ten of our machines are missing, including one which failed to return from a bombing raid Wednesday night.

"On November 10 rain fell nearly all day and made work in the air almost impossible. Many attempts were made by our aeroplanes to get in touch with our attacking infantry and a small amount of artillery work was accomplished. The rain continued throughout the night, and in consequence bombing operations had to be suspended. Such machines as attempted to work over the enemy lines returned safely to their airdromes."

ITALY

On Saturday night and Sunday, November 3 and 4, Italian aeroplanes and airships effectively bombed hostile troops in the basin of Caporetto and Tolmino and along the left bank of the Tagliamento. On Saturday Italian aviators brought down three enemy aeroplanes. One fell in the vicinity of Caldonazzo and the other two near the lagoon at Grado.

On November 6, Italian aeroplanes and airships repeatedly bombed enemy troops at work in repairing bridges over the Tagliamento or in movements across the river. Four hostile machines were brought down by Italian aviators.

In a special cable dispatch to the New York Times, Percival Gibbon tells how Italy has taken to the air like a duck to water. Aviation is becoming a national industry. For instance, in the morning Milan papers are on sale in the little town where the Staff has its home seven hours before they could arrive by train, having been freighted hither by a great Caproni aeroplane. Several aeroplane mails are running on various routes in Italy with fair regularity, while at the same time aerial warfare is spreading, developing and becoming more characteristic of the fighting on this front.

Mr. Gibbon had a talk with the aviator who brings the newspapers and asked him regarding the damage in Pola, which he has actually seen. He replied that he saw many fires which he ascribed to various localities and establishments of the dockyard, but was also personally convinced that two Austrian submarines were struck and sunk, while a number of other ships at anchor or moored to wharves were hit and damaged or set on fire. He said the Austrians were plentifully supplied with fast fighting machines, but rarely engaged in an aerial duel if able to avoid it.

He gave a brilliant impromptu word picture of the scene as he looked down on Pola, showing pale in the darkness with a shifting tangle of searchlights sprouting from it and gun flashes of anti-aircraft artillery lighting it up in momentary illumination. The last he saw as he turned homeward was a silhouette of the town against flames, and the red glow of burning buildings wonderfully reflected in the waters of the Adriatic.

This airman's opinion that Austrian aviators avoid duels is partially confirmed by the practical immunity with which Italians carry out elaborate bombing expeditions. Powerful squadrons of huge Caproni machines escorted by battleplanes winged over the high peaks of the Carnic Alps and swooped upon the railway junction of Assling, near Willach. This is a nodal point of Austrian communications and is always crowded with war traffic. The Italians sprinkled the station, roads, depots, and adjoining ground with over six tons of huge explosive and incendiary bombs, setting many structures on fire, hitting the station, and generally scattering the Austrian arrangements. In the afternoon they repeated the dose without losing a single man or machine on either occasion.

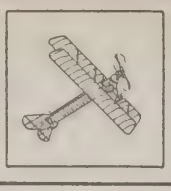
The American Aeronautic Mission, which left the United States recently for an intensive study of aviation in all its branches at the principal flying centers in the Allied countries, has just completed its trip through Italy.

Many tests of machines were made for the mission at the Caproni works. A trial flight of the Caproni triplane, equipped with a six hundred horse-power motor, has established the fact that a large aeroplane is capable of carrying a little more than 1,000 pounds of explosives for a great distance.

Guns, ammunition and even aeroplane manufacture are carried on in numberless factories located many miles from the immediate fighting front. The organization for the production of war materials is essentially of a most intricate and complicated character and should any part of this organization become impaired the whole would be apt to suffer. The object of a great aerial campaign should be to break the continuity of this working system and paralyze the entire industrial war unit of munitions and guns, so that a like output of the Allies may have an overwhelming superiority over that of the enemy.

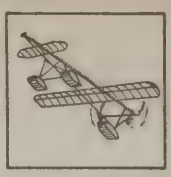
The chief war manufacturing plants of Germany are situated along the Rhine, in Westphalia, Baden, etc., and in Austria in Styria, along the South Railway, Vienna, Trieste, Bohemia and elsewhere. In order to reach these war material works and factories large aeroplanes are essential which are capable of carrying oil and benzine, sufficient to navigate the machine on its single and return trip to objectives 300 or 350 miles distant, and moreover to carry substantial quantity of high explosive to cause havoc and to state of complete paralyzation in Germany's munitions centers.

Trials recently made near Milan, which were witnessed by the mission, with the Caproni triplane, have firmly established the fact that this aeroplane for bombarding purposes is capable of conveying more than 1,000 pounds of high explosives on a sustained flight. A fleet of 100 machines could drop from 100 to 150 tons of high explosives on the important military cities of Essen, Pola, the war port of Austria, and on Steyr. The mission saw the return flight of a Caproni triplane returning from Turin, a distance of 120 miles in less than an hour. The machine carried ten persons.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
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8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
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TRIANGLE MODEL AERO CLUB
Baltimore, Md.
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DENVER MODEL AERO CLUB
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c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
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TEXAS MODEL AERO CLUB
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304 Chamber of Commerce Bldg., Indianapolis, Indiana
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c/o Edward P. Warner, Concord, Mass.
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c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

More About Scale Models

Theodore Hodgden writes again, this time expressing his opinion on scale models. His letter follows:

"I have noticed and read with interest the articles comparing the 'A' type model and the Scale model, which have recently appeared on the 'Model News' Page. Therefore I have decided to say a few words in favor of the scale model.

"I have built solid wooden models (for weather-vanes) 'A' type models, paper models and a number of scale models including a German Taube, and a Nieuport Scout biplane. The 'A' type models flew fairly well, but it is a disgrace to real aeroplanes to call them *Model Aeroplanes*. They are simply toys that fly, hopeless imitations of real aeroplanes. While on the contrary, scale models *are* models, and if enough power is installed and the center of gravity is placed relatively to the prototype of the model, it has simply *got* to fly! Moreover, the building of scale models gives the model builder an excellent idea of aeroplane construction. Of course, it takes much patience and perseverance to build scale models, but any individual not possessing these qualities should never attempt to take up model building.



Mr. Hodgden's Model "Taube"

"My experience with paper models has been exceedingly pleasant. I even went as far as to construct a paper model of the famous Curtiss 'JN—4-b' tractor with a wingspread of 12 inches—less than a fortieth the size of the real Curtiss 'JN.'

"I have enclosed a photo of my Taube model which flew fairly well. The tail as is seen in the picture is battered from an accident. The dimensions are as follows:

"Wingspan, 24 inches; overall length, 24 inches; driven by 8-inch propeller, turned by 50 feet of 1/16 flat rubber. The fuselage is square, with aluminum, top (rounded) and cowling.

A New Model Club Formed

Word has just been received from Mr. Thos. F. Stanton, Babylon, Long Island, that he has started a new model club in that town, to operate under the name, "The Correspondence Model Aero Club." For quite some time Mr. Stanton has been actively interested in building and flying models and in recognition of his good service we want to see his new adventure become a success, and in Mr. Stanton we are sure you will find a good advisor on the subject of model aeronautics. It is his purpose to bring the builders of model aeroplanes nearer that they may become more interested in model aviation and encourage others to do the same. The few simple rules which Mr. Stanton has temporarily adopted for the guidance of the club are as follows:

1. Write to each member of the club at least once a month.
2. Make letters interesting to the members by telling about aeroplane activities in their locality.
3. Build or plan model aeroplanes and tell each member of their results. (This rule is not compulsory.)

Of course it is to your advantage to get in touch with Mr. Stanton, who will be more than glad to supply any information that may be desired.

Aero Science Club Notes

In view of the fact that the club has obtained a work shop, it has decided to discontinue the holding of further meetings at its old address, 29 West Thirty-ninth Street, New York, and will in the future hold meetings every Sunday afternoon, at the club work shop at 2 P. M.

The work shop is situated at Ninetieth Street and Seventh Avenue, Bay Ridge, Brooklyn, N. Y. For the information of those who are unfamiliar with this vicinity we wish to state that the most expedient method of reaching the work shop is by taking the Fourth Avenue subway at Chambers Street, New York to Eighty-sixth Street and Fourth Avenue, Brooklyn, the shop being situated within a few minutes walk from the station.

Several of the members are hard at work designing machines, one of the machines under consideration being a special lightweight club machine. In a few weeks it is expected that great activity will be seen at the work shop. All members are requested to attend meetings at the new headquarters. Facilities are now afforded to the members which we believe are not afforded by other clubs. The work shop provides a place where the members can build models or full sized machines. A large field is in the near vicinity where the models or otherwise can be tested.

All persons interested are invited to attend meetings.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested

After Three Years

ON the scrap-head: German Zeppelins, German hopes.
Sunk without a trace: German submarines, German honor.

Camouflage: German attacks on Russia, German peace-terms.

"A WOUNDED German prisoner in England refused to go to a hospital."

"He knew that would be one of the first places bombed by the German raiders."

Try the Flying Squadron

Jim—May I join the Mosquito Fleet, father?
Father—No. Anything but aviation, son—*Widow.*

Why So Certain About the Future?—"Why are you going into the aviation service?"

"Might as well fly here, as hereafter."—*Orange Peel.*

German Arithmetic

1 GERMAN equals 10 unkultured foreigners.
2 soldiers equal 10 civilians.
3 officers equal 12 privates
4 treaties equal 8 scraps of paper.
5 poisoned wells equal 1 strategic retreat.
6 iron crosses equal 1 ruined cathedral.
7 Zeppelin raids equal 7 demonstrations of frightfulness.
8 eggs equal 8 hearty meals (common people).
9 eggs equal 1 appetizer (aristocracy).
10 deported Belgians equal 10 unmarked graves.
11 torpedoed neutrals equal 11 disavowals.
12 Gotts equal 1 Kaiser.

"I WONDER what the German people think of raiding open cities."

"Oh, just what the Kaiser tells them to think about it."

Doctor—Your throat is in a very bad state. Have you ever tried gargling with salt water?

Skipper—Yes, I've been torpedoed six times.—*Punch.*

"His feet kept him out of the Aviation Corps." "Flat?" "No; cold."—*Buffalo Express.*

Trajedy!

"Litely she tript along the streat in the direction of home and bliss and brekfast, carrying an eg in won and a slab of baykon in the uther, when the villan of this romans slipt out of a doorway and nearly tript her up.

"Rotter!" she cried.

"Will yew be mine?" he snarled.

"No! Go home!"

"To the casule ward? Bah! Will yew marry me?"

"What! A rotter like you! Puff!"

"Ah!" he sied, skweezing her and, " 'Ow devign!"

Partly becose she loathed the man, and partly becose the and he skweezed contained the eg, and did it no good, the bewtyus made agane cald him a rotter.

"I feel as if I am tredding on air," he said.

"Villan!" she hist. Yew are tredding on my fut!"

"Kiss me!"

"Go and eat coke!"

"Kiss me womon, or yew die!"

"Then I suppos I must die whether or not," she sed desparingly. "Here goes!"

She kist him; but——

Twoz the Kiss of Kontemt!

(Anuther fine romans next munth!—Author.)

[Per-haps!—Editor.]



SCENES IN AN AIRCRAFT FACTORY.—XV.—AN OFFICIAL VISIT BY THE CONTROLLER OF FRENCH-NAIL AND TIN-TACK SUPPLIES, COMPLETE WITH WIFE AND SUITE.—Strict instructions have been given to employees not to stare at the distinguished visitors, but to go on with their work as if nothing were happening. The order is obeyed literally by the sweeper in the foreground, to the discomfort of the Gentleman-in-Waiting behind him, to whom the Managing Director is displaying due civility. To the left, a lady worker whose pocket discloses a letter to "Miss Parker," is endeavoring to see the Controller through the back of the Works' Manager, who is explaining the firm's latest product enthusiastically to the Great Man and his Lady. A mechanic, busy operating on a tin-tack, is too interested in the visitors, with dire results to a strut. The Works' Adonis steadies the machine in a graceful attitude. The propeller swinger forgets the man on the top plane, and a plank-carrier also forgets to notice how he is turning. Meantime the Official Escort nobly does its duty on the right, albeit one of them is disguised in the effective manner well known to motorists.

Courtesy, *The Aeroplane*

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(*Continued from page* 420)

(a) The United States is admirably located geographically, permitting the dividing of the continent in three parts, running the airways across the continent in straight lines, which seems to be the best method for the aerial navigation of the future.

(b) On the other hand, it seems advisable to have the airways pass through important cities, making northern and southern airways somewhat tortuous. But even by doing this, it will be impossible to pass the airways through all the important cities.

(c) Custom and tradition have applied the terms "North" and "South" to sections of the country which are not so from an accurate geographic standpoint. As air travel is essentially navigation of the air by chart and compass, the same as navigation of the sea, it is advisable in establishing airways to have them follow as nearly as possible a directly easterly and westerly course. That exactness is not necessary in the routes which will interconnect the airways, and will run in every direction like a spider's web.

(d) In running part of the Wright Brothers Airway, the Chanute and Bell Airway and the Langley Airway through "undeveloped and thinly populated country, there is being taken into consideration the fact that aerial transportation will be a strong factor in the development of those parts of the United States, and that it is quite possible that communities will be built around railroad stations and trails. These airways will typify the pioneer spirit of the Wrights and Langley. They will give highways and transportation to those parts of the United States that do not have them.

(e) It is also taken into consideration the advantage of establishing the airways as much as possible along national highways, so as to gain the advantage afforded by the work done and being done in establishing supply and fuel stations.

An ideal plan would be to have the highways made large enough, with no telegraph poles or trees on the sides to make it possible for the aeroplanes to land on them. Also to arrange to have aeroplane parking places at intervals of from twenty to fifty miles each, with supply and fuel stations.

The above are only some of the many considerations that come up in connection with the establishing of the Airways, which will be discussed during the Aeronautic Convention to be held during the Pan American Aeronautic Exposition to be held at the Grand Central Palace, February 16th to 23d.

Post Office Could Use 2,000 Aeroplanes and Train Aviators in Cross Country Flying and Bomb Dropping

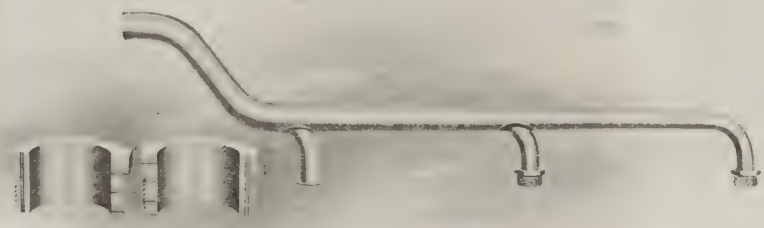
The reason why a substantial percentage of aircraft manufacturers are idle and the Government has no orders to give them is that last year when it became known that the aeronautic industry was insufficient to meet the possible Government demands for manufacturing facilities, many large manufacturers of automobiles and allied industries offered their facilities to the Government. When Congress granted the appropriation of $640,000,000 for Army aeronautics, it was found that more than half that sum was to be spent to establish large Army training camps with the necessary hangars, barracks, administration buildings, etc. Therefore, the sum left for the actual purchasing of aeroplanes and aeronautic equipment was not large enough to keep more than half of the manufacturers busy. The other half have been working at only part of its capacity, and some of the manufacturers must go out of business in the near future unless Congress grants additional appropriations for aeronautics soon.

All these manufacturers will be needed to produce the tens of thousands of aeroplanes needed by the United States and the Allies, with which to strike Germany through the air, and it would be an irreparable loss to permit them to go out of business. The Aero Club of America is making every effort to create business for them.

The Post Office Department has been asking for aeroplanes for carrying mail for years, and has outlined about 200 different air routes where the aeroplane would solve difficult problems of mail transportation. From four to eight aeroplanes would be needed for each route, and supplying them would keep busy the manufacturers that are now idle and develop additional manufacturing facilities to meet the call for a large number of aeroplanes, which the Aero Club feels is sure to come as the result of the Allied Conference in Paris.

Putting this plan into effect would also give practice in flying to thousands of men from which the Army and Navy could draw as fast as it needs them. As the work of flying across the country and dropping mail bags is identical with the work of bomb dropping aviators, they would get practical training and the aerial mail service would become a practical training school for military aviators.

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Goodyear Acquires Large Rubber Plantation

One of the many lessons that war conditions have brought forcibly to the attention of American manufacturers, is that without control of raw material supply back to the source, in case of a disturbance in market and transportation conditions, business can expect to be greatly handicapped.

The rubber industry learned this lesson early in the war, when England established an embargo on crude rubber, and through her control of the far eastern rubber plantations was able to make it effective. In this way she helped to maintain her trade balance and insured the prevention of reshipment of rubber from neutral nations to the central powers.

Rubber manufacturers, however, were later permitted to obtain crude rubber on their written agreement to withold shipments of rubber or rubber products, from the central powers and certain neutrals that might reship to them. The shipment of crude rubber to this country is still contingent upon the observance of this agreement.

The Goodyear Tire & Rubber Company, however, sensed the difficulties that lay ahead in the crude rubber world several years ago, and sent representatives to investigate rubber plantations in the far east, with the idea of protecting its own rubber supply back to the tree, through the establishment of its own plantations.

As a result of these investigations the company now owns a concession of 20,000 acres near Medan, Sumatra, where the problems of growing rubber for Goodyear's multitudinous needs are being worked out. At the time this tract was purchased about 2,000 acres were already producing rubber. So that rubber from this plantation is now coming to the factory at Akron and as the company's plantation managers are able to work out their intensive methods of rubber culture, the proportion of crude rubber coming from the Goodyear plantation will become larger and larger.

The plantation is divided into six divisions, each having its own manager. In addition to the one dvision which is now producing, several have been planted with young rubber trees, while still others are being cleared off preparatory to planting. In clearing the thicket Chinese coolies are used for the heavy work and the natives for the tasks that do not require so much muscle. All the good lumber is saved and used to build living quarters for the workers.

In former days it required 250 coolies to plow 3 acres in a day, but Goodyear has introduced new methods, and by utilizing a tractor 20 acres are now turned over in that time. While the land has been cleared off and prepared for planting, young rubber trees have been growing in the nursery beds, and are set out when from six months to a year old. 7,000,000 seeds have already been planted in these beds to grow the trees for the Goodyear plantation.

In the meantime the company has its rubber buyers in all parts of the world, ready to take advantage of every opportunity to secure good rubber. These men are in constant touch with the factory at Akron, cabling almost daily—although rates are high, and in these war times no abbreviated code messages are permitted.

The world's rubber production for this year is placed by conservative authorities at 250,000 tons, which is about double the production at the beginning of the war. About 60 per cent of this is used in the United States, Goodyear, alone, consuming 10 per cent of the world's supply. November 6, 1917.

Artillery Fire Directed from Planes by Wireless

On the Western battle front the aeroplanes that direct the artillery fire of the allied forces are fitted with wireless apparatus of sufficient power to communicate to a distance of from 16 to 24 miles. The aviator can transmit and receive messages without difficulty in spite of the constant humming of the aeroplane's motor. The electricity is supplied by a small dynamo connected with a screw placed in front of the machine and actuated by the motion of the air. When a shot is fired the observer immediately notes where it has fallen, and reports by wireless to the officer in charge of the artillery in that particular sector as to the accuracy of the fire.

War French

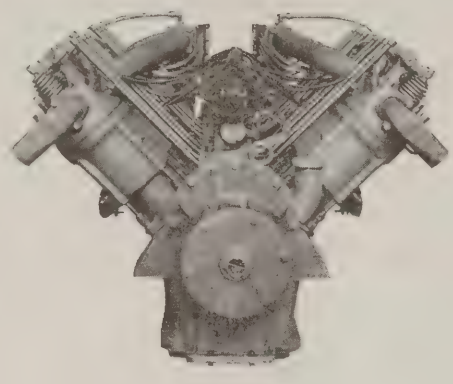
Colonel Cornélis De Witt Willcox, professor of modern languages at the United States Military Academy at West Point, has done a real service to the boys who will go "over there" by preparing a handy pocket-sized volume called "War French." The book is not intended to answer the purposes of a complete grammar. It seeks to present the elements of French in such a way that the reader may acquire speedily a working knowledge of the language. While intended primarily for the use of soldiers who may see service on French soil, it will yet be found of value to the general reader who desires a simple introduction to French. The text is divided into three main sections as follows: The French Language, The French Army and Passages for Translation; then come the vocabularies. The author is both an authority on French and also on technical military terms, and the vocabularies which he has prepared are both complete and accurate in the matter of scientific and military terms in use in France with which every American soldier will have to be familiar. The book can be had from the Aeronautic Library, 280 Madison Avenue, New York. Price, 75 cents.

Kenneth Bancroft Appointed Advertising Manager

Aerial Age takes pleasure in announcing that Mr. Kenneth Bancroft has been appointed its Advertising Manager. Mr. Bancroft has had wide and varied experience in advertising work in France, England and America. He was formerly associated with the Hugh McStamney and A. M. Sweyd advertising agencies, previous to which he was connected with the publishing houses of George Newnes, Ltd. (Strand Magazine), and A. W. Shaw Company (System) of London, England.

Acquiring Wings

From his wide practical experience William B. Stout, who was formerly aircraft engineer of the Packard Motor Car Co. and who is now in the Aviation Section of the Signal Corps, has written a small work entitled "Acquiring Wings" which should prove to be of very real value to the aeronautic student, especially to the man contemplating enlistment in the Aviation Section. It is a practical book on the basic principles of aviation, giving in much more concise form than heretofore the fundamentals regarding aeroplane construction and design which the ground student should know preliminary to his actual training on a machine. The illustrations are clear and comprehensive, and after its perusal the reader should be in excellent shape for a broad understanding of ground school lectures. The book can be secured from the Aeronautic Library, 280 Madison Avenue, New York. Price, 75 cents.



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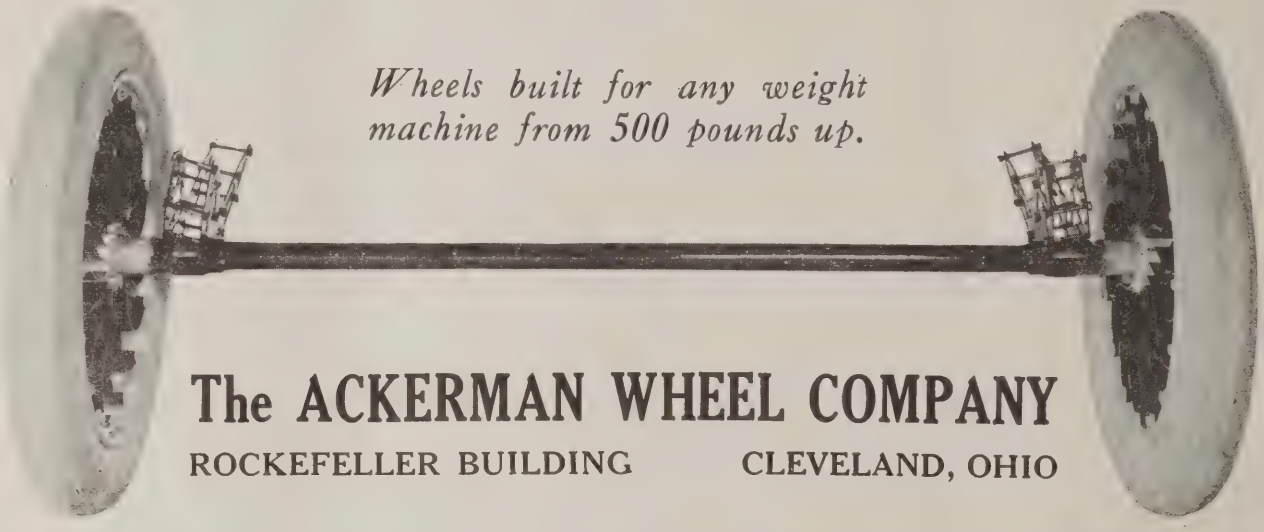
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By HENRY WOODHOUSE

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The United States Naval Institute Proceedings Says:

"Mr. Woodhouse has been intimately associated with and interested in the advance of aviation in this country for many years, and his articles are familiar to and appreciated by most of us. His latest effort meets a long felt want, but especially so from the viewpoint of one interested in naval aeronautics, whether he belongs to any branch of the naval flying corps or to any other branch of the service. Many inquiries have been received from both officers and enlisted men asking for a book which covered the fundamentals and aims of naval aeronautics, at the same time telling what had been accomplished to date, and this book is most admirably suited for that purpose.

"It contains 260 excellent illustrations, which in themselves alone make the book valuable and which force upon the reader the realization of what has already been accomplished and what is yet to be accomplished by this country. There are innumerable books on aeronautics, practically all of which are incomprehensible to the layman, and none that cover naval aeronautics so thoroughly. This is the first book that has come to our notice which is so written that it is of value and most interesting to the novice as well as to the expert airman. Facts are told in a clear, concise, readable way, without undue use of technical terms, and yet certain chapters are sufficiently technical for the expert.

"Mr. Woodhouse enumerates the uses for which naval aircraft have been employed during the present war, and then proceeds to relate actual occurrences, which in every instance are well illustrated. Next he shows the aerial defences needed to adequately protect the United States, in comparison with what has been found necessary by Great Britain.

"For the information of the beginner there are chapters on nomenclature, administration, safety orders and regulations. Rules for the British Flying Corps, training of aviators, courses of instruction and required qualifications of personnel for the Air Service of the United States, regulations relating to enrollments in the United States Naval Reserve Flying Corps, and rules governing tests for the Federation Aeronautique Internationale Pilot Certificates.

"Of interest to everyone are the chapters discussing aeroplane guns and aerial gunnery, night flying, instruments for aerial navigation, United States Navy Aeronautics, Naval Militia Aeronautics, Aerial Coast Patrol, evolution of the seaplane and the flying boat, naval dirigibles, and other subjects."

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FIRING AT CAPTIVE BALLOONS

(*Continued from page* 432)

Slide the ruler so that the division mark on the scale that corresponds to the sum of the reported sight-angles (v′ + v″), (Fig. 1)—the complement of the angles under the distance from the battery to the target is seen by the observers, who by a simple sight-arrangement can directly read them—is put opposite the mark on the fixed scale that corresponds to the distance between the observers. The distance to the target is read off in *hectometers* on the edge of the scale—as a quotient according to A. I and on account of the scales being lotharithmic—or if this should fall outside the scale in *tens* of *meters* opposite the 100 mark on the ruler. If only one observer is used his reported sight-angle and distance to the battery are used.

2. Determination of the variation in range of the burst.

Slide the ruler so that the curve that corresponds to the distance between the observers, cuts the edge of the distance arm at the point corresponding to the distance mark. The variation in range is read directly in meters on the fixed scale opposite the division that corresponds to the algebraic sum of the observers' reported side angles in points—as a product according to A. II and on account of the property of the scale to be logarithmic—; for a sum of the angles less than 100 points read both scales at 1/10 of what the numbering indicates. In only one observer is used, observations are also made at the battery, which are recorded negative if the burst occurs on the same side of the line to the target as the observer, and positive if they fall on the opposite side.

Since the above was written I have learned that an English proposition of similar nature has appeared. Since in this connection, it may be of interest, I allow myself to add a few particulars about it. The English instrument, which does not distinguish itself for simplicity in design, consists of an expression for the formulas:—

$$\delta = \frac{a}{b} \cdot \frac{\text{Sin } \beta}{\text{Sin } (\beta - \theta)} \cdot \omega - \frac{c}{b} \cdot \frac{\text{Sin } \theta}{\text{Sin } (\beta - \theta)} \cdot \psi \text{ and}$$

$$e = \frac{5}{y} \cdot \frac{C \text{ Sin } (90° - \theta)}{3440 \text{ Sin } (\beta - \theta)} \cdot \psi - \frac{5}{y} \cdot \frac{a \text{ Sin } (90° - \theta)}{3440 \text{ Sin } (\beta - \theta)} \cdot \omega,$$

in which

a = distance from O′ to target.
b = distance from the battery to target.
β = the angle under which the battery and O″ are seen at the target (positive to the right of the shot direction).
θ = The angle under which the battery and O′ are seen at the target (positive to the right of the shot direction).
ψ = the angle of deviation of the burst from O″ (positive to right).
ω = the angle of deviation of the burst from O′ (positive to right).
y = distance corresponding to 5′ charge in E.
δ = necessary correction in side setting angle.
e = necessary correction in vertical setting angle.

The angles are expressed in minutes, distances in yards.

(*Continued from page* 430)

Felt from the Purchasing Agent's Standpoint

In these times when many purchasing agents are trying to buy as cheaply as possible, it is not surprising to see cheap Felts bought and installed, for in few instances does the purchasing agent realize that a cheaper price means cheaper Felt—Felt to most of them is simply Felt. This is in no sense a reflection on the purchasing agent, for he has never been educated in Felt values. In some cases we find a thick, cheap, soft, mushy Felt being used to eliminate vibration or to act as a cushion—with the result—it flattens out like a pancake and affords no cushion at all. In instances like this, a thinner but firmer and better grade of Felt can be used with much better results.

Not always does the purchasing agent buy too cheap a grade of Felt; on the other hand, very recently, a purchasing agent wast about to place an order amounting to over $30,000, and was shown where something much cheaper functioned better, and meant a saving of over one half the cost.

From the Engineer's Standpoint

Engineers are better versed in this particular and many know that different Felts function differently, but cannot tell why.

Felt to them is an enigma, but before very long they will become educated and can test Felts and can ascertain just what quality, what density and what thickness, functions best, for a given purpose and will be able to specify clearly to the manufacturer of their Felt parts in their orders, just what they want and can check up the goods when they receive them and know whether or not they received what they ordered.

Felt Uses Rapidly Increasing

The use of Felt parts is bound to increase as engineers and inventors become more familiar with Felt and its various properties.

Piano manufacturers have long appreciated the importance of Felt in the construction of their pianos, Felt being used very extensively and performing various functions.

Automobile manufacturers and motor builders are installing more Felt parts every day—discontinuing the use of rubber, leather, etc.—materials whose function is resiliency.

Aeronautic engineers are fast appreciating the value of Felt as an absorber of shocks and a noise deadener; also as padding and bumpers. Also the very important part it can play in the all-important problem, with aircraft engineers—the elimination of vibration.

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AERIAL AGE WEEKLY

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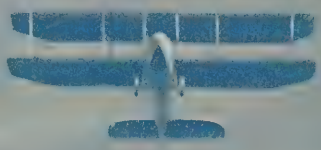


Activities at a Balloon Training Field "Somewhere in America." Passed by the Censor.

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VOL. VI. NEW YORK, NOVEMBER 26, 1917 No. 11

HUGE BOMBING MACHINES AMERICA'S MOST VALUABLE CONTRIBUTION TOWARDS ALLIES' AERIAL SUPREMACY

FOLLOWING the statement that Washington recognizes officially the value of large machines, as related in AERIAL AGE for November 19, the *Washington Times* prints the following:

"There will be little of the spectacular in the glory the American aviators will win 'over there.' This became evident when it was learned that the great fleet of American aeroplanes to be sent into the European warfare will not be combat machines. America will concentrate on heavy bombing machines. These machines will do the heavy offensive work but will do little of the picturesque air fighting which is chronicled daily.

"The work of bombing aeroplanes is dangerous work and exceedingly important. It carries with it the balance of air victory. It has been impossible for the Allies to retain permanent air supremacy because they have had to devote their energy to combat machines. Now the weight of the air fighting is placed upon America—in the great fleet of heavy bombing machines which America can turn out, and in the American men to man them lies the possibility of victory.

"The air program of the United States is ahead of schedule. There is every evidence that January 1 will find American aircraft far more numerous than the most optimistic ever dreamed of. The original program called for 20,000 machines ready for service by July 1. It now appears that, with sufficient money appropriated by Congress, the United States can turn out more than 50,000 aeroplanes by January 1, 1919.

"America's air policy like America's military policy, is hanging fire to certain degree, awaiting action by the Allied conference to be held in Paris shortly. It is confidently believed, however, that the Allies in conference will ask the United States to increase its air program and to construct heavy fighting machines to the utmost capacity of her factories.

The air policy of America has been decided only in so far as it concerns the type of machines. It is agreed that with the types of battle planes changing almost weekly, that America is too far from the front to attempt to keep to the fore in combat machines. Heavy aircraft, sorely needed by the Allies, do not change in type so frequently. Hence American resources are to be thrown into this type of machine."

In connection with this it will be well to repeat the resolutions adopted at the annual meeting of the Aero Club of America, urging the creation of an Allied Air Board and the utilization of a huge fleet of large machines. The resolutions are as follows:

"*Whereas,* the greatest difficulty of the Allies has been to move their forces fast enough to meet unexpected German attacks on weak points of the Allies' line, and to overcome the advantage which the Germans have of being able to transport large bodies of troops, ammunition and supplies from one part to another by interior lines; and

"Whereas, it is evident that powerful warplanes afford the needed combination of power and mobility in a higher degree than to do any other appliances, and that the recent occupation of the Baltic Islands by Germans and the Italian reverses in the province of Venezia could have been prevented if the Allies had been able to send a sufficient number of torpedo-planes and bomb-dropping aeroplanes to assist the Russians and Italians at the first evidence of danger; and

"Whereas, it is generally accepted by the recognized authorities on aeronautics that aeroplanes can easily be built which can fly across the Atlantic, and thereby solve the problem of delivering large units of aeronautic power to England, France, Italy and Russia, without dependence on ocean transportation, or interfering with it; and

"Whereas, there are in the United States unutilized manufacturing facilities and resources which could build thousands of powerful warplanes during the coming year, without interfering with the present aeronautical programs of the Army and Navy; and

"Whereas, with these warplanes there can be conducted major aerial operations against the German fleet and U-boat bases, as well as against the German lines of communication and military industries and forces:

"Be it resolved that these facts be brought to the attention of the President, the Council of National Defense, the Secretary of War, the Secretary of the Navy, the Aircraft Production Board, and the American public, through the press and that the coming Congress be urged to expand the present aeronautic program by appropriating not less than $1,000,000,000 for building an 'Emergency Air Fleet,' of huge warplanes; and also another another $1,000,000,000 to carry out a comprehensive aeronautic program of training aviators and building the tens of thousands of fighting, photography, artillery, and contact patrol aeroplanes; the dirigibles and balloons, which are needed to assure the Allies' supremacy in the air."

Creation of Allied Air Board Urged

Another important resolution adopted at the meeting urged the creation of an Allied Air Board, to coordinate the aeronautic efforts and resources of the Allied countries.

Separate Department of Aeronautics Urged for United States

The resolution which was adopted at the last annual meeting of the Club, urging the establishment of a Department of Aeronautics separate from and independent of both the Army and the Navy, its head a member of the President's Cabinet, and in full and undivided control of aeronautics was again adopted. It was brought out that Great Britain is creating an Imperial Air Service, independent of both the Army and the Navy.

The Aero Club of America pointed out over a year ago the necessity of concentrating on turning out large aeroplanes. It has also urged for two years the creation of a separate Department of Aeronautics—and it has urged for many months the necessity of appropriating One Billion Dollars for aeronautics.

All the Club's recommendations seemed extreme when they were made, but they looked very conservative a year later. We have no doubt that its recommendation to appropriate another Billion Dollars for aeronautics at the coming session of Congress will look conservative a year from now.

GREAT BRITAIN'S NEW AIR MINISTRY

THE letter from Lord Northcliffe to the British Premier, Lloyd George, declining the post of Air Minister and head of the British Air Forces brings out the fact in which strategists all over the world have agreed for the past three years, that it is necessary to have an independent Department of Aeronautics, with a Cabinet Officer at the head, who will have the same standing in the Cabinet as the Secretary of War, and the Secretary of the Navy.

Lord Northcliffe's letter follows:

"Dear Prime Minister:

"I have given anxious consideration to your repeated invitations that I should take charge of the new Air Ministry. The reason which impelled me to decline that great honor and responsibility are in no way concerned with the office which is rightly to be set up. They are, roughly, as follows:

"Returning after five months spent in the virile atmosphere of the United States and Canada, I find that, while these two countries are proceeding with their war preparations with a fervor and enthusiasm little understood on this side of the Atlantic, while the United States instantly put into operation conscription, over which we wobbled for two years, and is making short work of sedition mongers, while Canada already has given such proofs of thoroughness as the disfranchisement of conscientious objectors and the denaturalization of all enemy aliens naturalized within the last fifteen years, while we, for our part, are asking immense sacrifices from these peoples, there are still in office here those who dally with such urgent questions as that of unity of war control, eradication of sedition, mobilization of the whole man and woman power of the country, and the introduction of compulsory food rations.

"I had personal experience while in America of the obstruction and delay in certain departments in London, which, for example, postponed sending Lord Reading's vital and most successful mission. I find the censorship still being misused and that men in various positions of authority, who should have been punished, have been retained and in some cases elevated.

The spirit of the men and women of Great Britain is clearly as eager and splendid as ever. We have, in my belief, the most efficient army in the world, led by one of the greatest Generals, and I am well aware of the fine achievements of many others of our soldiers, sailors, and statesmen, but I feel in the present circumstances I can do better work if I maintain my independence and am not gagged by a loyalty that I do not feel towards the whole of your administration.

"I take this opportunity of thanking you and the War Cabinet for the handsome message of praise sent to me as representing the five hundred officials of the British War Mission to the United States, many of them volunteers and exiles. Their achievements and those of their ten thousand assistants deserve to be better known by their countrymen.

"The fact that their work is not known is due to the absurd secrecy about the war which still is prevalent. Every thing these officials are doing is known to our American friends, and, of course, to the Germans.

"I trust I make no breach of confidence in saying that some of the documents which have passed through my hands as head of the mission are such as, if published, would greatly increase our prestige in the United States and hearten our people at home.

"May I also take this opportunity of giving warning about our relations with that great people from whom I come? We have had the tragedy of Russia, due partly to lack of allied propaganda to counteract the Germans. We have had the tragedy of Italy, largely due to that same enemy propaganda. We have had the tragedies of Serbia, Rumania, and Montenegro. There is one tragedy which I am sure we shall not have, and that is the tragedy of the United States.

"But from countless conversations with leading Americans I know that unless there is swift improvement in our methods here the United States will rightly take into its own hands the entire management of a great part of the war. It will not sacrifice its blood and treasure to the incompetent handling of the affairs of Europe.

"In saying all this, which is very much on my mind, believe me, I have none but the most friendly feeling toward yourself and that I am greatly honored by your suggestion.

"Yours sincerely,

"NORTHCLIFFE."

American Airmen Join In Bombing German Cities

NEWS reaches us of the first participation by American airmen in bombing raids on Germany. The despatch from the American army headquarters in France, under the date of November 14, is as follows:

"American army aviators have participated in bombing raids over Germany and have been doing observation duty at various points on the battle line.

"The aviators are officers of the Regular Army, some of whom had been flying before the United States entered the war. Others have been on duty at training centres.

"On the raids the Americans have been carried in French planes as bombers, observers, and pilots, and have gained much experience which in the future will assist them, as well as the new members of the air service who are arriving or are to arrive.

"Some of the Americans were in recent raids in which bombs were dropped on German positions of military importance. The observation work has been done at many points but none of the machines carrying Americans has flown over the sector where the American troops are entrenched.

"Numbers of French machines have been turned over to the Americans, but thus far none has been engaged in aerial fighting of importance. No casualties among the American airmen have been reported, although enemy airplanes have fired heavily upon them.

"The Allied officers are enthusiastic over the work of the young flyers, and say they combine the daring of the British flyers and the technique of the French airmen. All the operations have been, in a measure, in the nature of instruction."

M. Tardieu, the French High Commissioner to United States, On Return to France, Pays Tribute to American Mission to War Council

M. ANDRE TARDIEU, high commissioner of the French Government to the United States, has just landed in France, accompanied by M. Ganne, director of munitions, and M. Casenave, minister plenipotentiary, and assistant director of financial contracts. Upon his arrival, M. Tardieu made the following statement, which has been transmitted to the committee on public information through the courtesy of the French Government:

"The presence in Europe of the American mission is an event upon the importance of which it is superfluous to comment. Col. House by his eminent qualities has merited the confidence of President Wilson. I have had many opportunities to observe him, and no finer representative of American idealism could have been selected. He will represent among us completely the thought and will of the President of the United States. Six months of daily collaboration with the American Government permits me to affirm that all the Allies will benefit from it.

"The men who accompany Col. House are at the head of the most important war services. They are my real friends, and I know from experience the admirable work that may be expected.

"I am just arriving and am in ignorance of the details in respect to the program of the coming inter-allied meeting. Whatever is the importance of this meeting, it will not be the end of our common duty. We must together create a central organ for the direction of the war. For this idea I have fought since my return from the front. I believe in it more than ever as a necessity of victory and hope that to-day we are on the eve of its realization."



THE NEWS OF THE WEEK



Americans Cited for Bravery at Guynemer Service

Headquarters of the Lafayette Escadrille, Nov. 14.—An impressive service was held in honor of Captain George Guynemer, the famous French airman recently killed in combat. The scene was the aerodrome of a noted fighting unit of the French air service—the aerodrome from which the members of the Lafayette Flying Squadron and their French comrades daily go out to give battle to the German airmen.

Here in a hollow square on the Flying field were drawn up the personnel of the four fighting squadrons quartered at this place, who listened to an inspiring address by the commandant of all the French aeronautical forces.

After the service there was a distribution of the honors recently won by French and American pilots. The Americans decorated were Lieutenant Raoul Lufberry, now seventh on the list of French aces, and Sergeants Robert Rockwell, Robert Soubiran and David McKay Peterson. Their citations were as follows:

Lufberry — "A remarkable pilot who, on October 24, in the course of three successive patrols and seven close combats, brought down his fourteenth adversary and forced five others to fall out of control."

Rockwell—"A fighting pilot, bold and skilful, who has had many battles and who met an enemy formation in superior numbers on September 24 and forced one opponent to land out of control in his own lines."

Soubiran—"An American engaged in the French air service since the beginning of the war; member of the Foreign Legion; took part in the battle of the Aisne in 1914 and the Champagne attack in 1915; wounded October 19, 1915; entered aviation service and proved a remarkable pilot; forced an enemy to fall in October while protecting aviators who were attacking an enemy observation balloon."

Peterson—"An excellent fighting pilot; brought down an enemy on September 19, following the falling German to within 500 yards of the ground regardless of a heavy fire from an enemy battery; machine-gunned enemy trenches and reserve troops from very low altitude on October 24."

Augustus Post Returns from Europe

Augustus Post, special delegate of the Aero Club of America, returned last week from Paris, where he has been organizing the Foreign Service Committee of the Aero Club of America. In the course of his sojourn he had an interview with Signor Caproni, the famous Italian designer. The inventor of the mammoth Italian aeroplanes told Mr. Post that he had such a faith in the progress of aviation in America that he believed it likely that the United States might send an air fleet to Europe by direct flight from American shores. Mr. Post continued:

"Caproni praised American aviation. He said that the American temperament seemed to be suited to great achievements in the air. Great interest is manifested abroad as to what America will do in the air as part of its move against Germany."

Benedict with Glenn L. Martin Co.

Mr. Howard G. Benedict, recently Works Manager of the Aeromarine Plane & Motor Co. and formerly Works Manager and Consulting Engineer on factory management with several automobile and other manufacturers, is now Works Manager of The Glen L. Martin Company, Cleveland, Ohio.

Motor Trucks of America

Announcement is made that the 1918 edition of "Motor Trucks of America," of which S. V. Norton, manager of truck tire sales of the B. F. Goodrich Rubber Company, is the author, will be ready for distribution on Jan. 1st. The book, consisting of 200 pages of reading matter, illustrations and specifications, is the sixth to be issued in as many years. It is hand sewn and of heavy binding.

Complete specifications of nearly 150 of the leading gas and electric-driven motor trucks are contained in the volume. In fact there are thirty-one specifications for each model. These details are absolutely dependable as the approval of each truck manufacturer is obtained before specifications of his model are inserted. For the reason it offers opportunity to the buyer and manufacturer to compare models, lists all makes according to sizes and affords a perspective on changes of design by comparison with previous editions, "Motor Trucks of America" is accepted throughout the motor world as the one complete and authentic handbook of the truck industry.

The illustrations, too, add much value to the book. They picture the very latest models and furnish the man in the market for a truck, or the manufacturer themselves, for that matter, suggestions for special bodies for particular line of work.

Saves Airman in Sea, Gets First U. S. War Medal

Washington.—The first medal of honor "for extraordinary bravery" to be awarded to an American fighting man during the war has been given to Patrick McGunigal, of Youngstown, Ohio, the Navy Department has announced.

McGunigal is a ship's fitter aboard a United States cruiser in the war zone. His heroism in rescuing the pilot of a naval kite balloon from drowning brings him, with the honor medal, a gift of $100 from the Navy Department.

The captive balloon of the cruiser was 400 feet in the air, its observer searching for submarines, when the balloon dropped 200 feet. The spare cable was hauled in on the ship, but the basket was whipped and twisted and the pilot was so entangled in the ropes that there was no possibility of his releasing himself. The balloon was hauled to the ship's side, but the basket trailed in the water, submerging the pilot.

McGunigal, who has been fourteen years in the naval service, went over the ship's side and jumped to the ropes. He cleared the tangle, and fastened a bowline around the pilot, who then was hauled on deck. McGunigal was so exhausted from the struggle with the heavy seas that he had to be rescued by others aboard the cruiser.

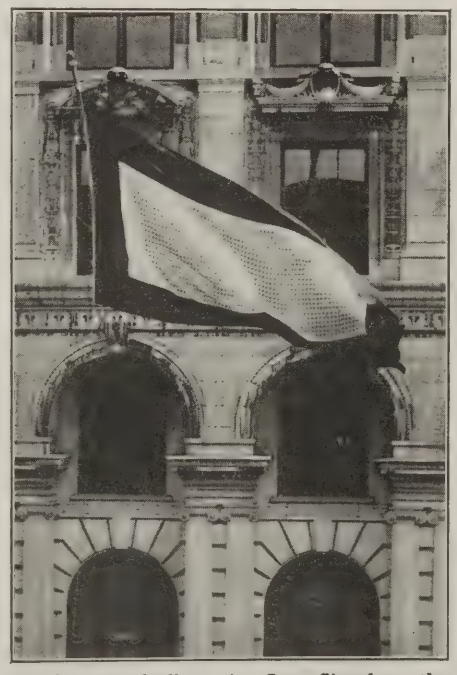
Mother to Get Medal Awarded Slain Flier

Headquarters of the Lafayette Flying Squadron.—Members of the Lafayette Squadron, representing Mrs. Beverly MacMonagle, have received in her behalf the Cross of War with Palm, awarded to her son, Corporal Douglas MacMonagle, of San Francisco, who was killed in an air combat on the French front on September 24.

Corporal MacMonagle is cited in the award as a "skilful pilot, worthy of the highest praise for his courage and unselfish devotion to duty." Corporal MacMonagle had previously been awarded the Cross of Victory for bravery.

Two Aviators Killed

Fort Worth, Texas, November 12.—Lieutenant Johnson and Cadet Maloney, members of the Canadian Royal Flying Corps, were instantly killed when their machine fell near here late this afternoon.



The largest of all service flags flies from the third floor of the 20-story United States Rubber Building, Broadway and 58th Street, New York. The flag contains 1544 stars; and new stars are being added every week. This is the greatest number of stars yet to be displayed on any service flag and represents the red-blooded patriotism of the vast number of United States Rubber Company employees that have entered all branches of our fighting forces.

Governor and Wife to Fly

London.—Governor R. L. Beeckman of Rhode Island arrived in London November 12, on his way to France, where he will deliver a personal message from President Wilson to the American troops and the greetings of the people of the New England States to their sons in the United States Army contingent. The governor, who is accompanied by Mrs. Beeckman, said to the Associated Press to-day:

"We plan to fly from London to Paris. Just when and where we will start cannot be divulged owing to military requirements. I will fly in one machine and Mrs. Beeckman in another.

"My reason for the proposed flight is simply that I want to face some dangers, when our brave boys in France are facing so many. I reasoned that they are daily taking much greater risks, and I thought that nothing would hearten them more than the knowledge that one of their governors took a sportsman's chance to bring them greetings from President Wilson and the people of New England."

Gnome Engine Order for General Vehicle Co.

Long Island City, N. Y., Nov 9.—The General Vehicle Co. has been given an order for 1,000 Gnome engines for aeroplanes according to a report in *The Automobile*.

Machine Tools Seized by Government

New York.—Six hundred machine tools, valued at $10,000,000, were commandeered last week by the Government through its Machine Tool Section of the War Industries Board. They were taken from warehouses at various seaports. Some of them were stored for over a year and were destined for Sweeden.

Some of these machine tools have been turned over to the Simplex Automobile Co., which has started work on its order for Hispano-Suiza engines for the Aircraft Production Board.

Lincoln Factory Progressing

Detroit.—The Lincoln Motors Co.'s plants are well under way, the chief difficulty being in obtaining machinery. It is hoped that production on aeroplane engines may be started in three weeks.

Aeronautics Taught at Goodyear Factory

Akron.—The Goodyear Tire & Rubber Co. has started a factory school for the purpose of instructing its employees in aeronautics. This course will occupy two evenings a week and will incorporate a considerable amount of mathematics. For this reason all applicants must have a high school course or its equivalent and a small tuition fee is required to cover necessary expenses. This course was deemed necessary, as the Goodyear company is manufacturing a large amount of material for the signal corps, and hence its employees if specially trained would be of great value to the Government.

New American Records Made

During a flight from Chicago to San Antonio; which was completed on November 13, several new American records were made.

An L. W. F. machine, piloted by H. W. Blakeley, left Chicago on Sunday, Nov. 11, in a driving rainstorm. Blakeley flew from Chicago to Muskogee, Okla., about 650 miles, at an average speed of 120 miles per hour. The distance from Muskogee to Dallas, Tex., was made at an average speed of 130 miles per hour.

The great bursts of speed of the L. W. F. machine were made with the eight cylinder 210 hp. aluminum engine manufactured by the B. F. Sturtevant Co. of Hyde Park, Boston, Mass. Detailed reports of the performance of the engine during the flight are not yet available, but the flight indicates that another American engine of great power, speed and endurance has been successfully developed and tried out.

Inspection Tour of Aircraft Factories

A special committee of the National Advisory Committee for Aeronautics left Washington, D. C., Nov. 7, for a short trip to inspect aircraft plants and flying fields. The members making the trip are Prof. William F. Durand, chairman; Dr. Charles D. Walcott, secretary of the Smithsonian Institution; and Dr. S. W. Stratton, Director of the United States Bureau of Standards.

It is the object of this committee to establish closer relations between the manufacturers of aircraft and parts with the Government bureaus, and to keep itself informed as to the most recent developments in aeronautical progress.

The committee will visit plants at Dayton, Ohio, Detroit, Mich., and Buffalo, N. Y., and the neighboring flying fields operated by the Signal Corps.

Government Orders for Curtiss and Thomas-Morse

Buffalo.—The Curtiss Aeroplane and Motor Co. and the Thomas Morse Aircraft Co. have been given orders by the Navy Dept. The Curtiss company was awarded a contract for nineteen Curtiss H-12 type machines with power plants, at a total cost of $597,230. The Thomas-Morse Co. will supply six seaplanes with power plants, at a total cost of $47,400.

Calmest Man at Fort Omaha Is Instructor Leo Stevens

His life is just one thrill after another, but you'd never guess it. The calmest man in Fort Omaha is Leo Stevens, chief instructor of the Army Balloon School, but thrills have been a daily occurrence with him for years, so it would take the mightiest cataclysm of nature, coupled with the most diabolical onslaught of the Kaiser's men, to make him bat an eye.

The other night he hopped into a free balloon and took a little ride "cross country." To the students with him it seemed the most exciting adventure of their lives, but Leo Stevens, on returning, merely put a little dot by Des Moines on the map in his office and forgot it.

This flight was the longest one yet taken by Fort Omaha men. In three hours and fifty minutes, carried along 5,000 feet above the earth by a terrific wind, the swaying balloon sailed 285 miles.

At one minute to 12 the students and Mr. Stevens climbed into the basket. Slowly the big bag rose, higher and higher.

"We'll go up about 5,000 feet," instructed Stevens. "There is a fast current there now. I can tell by the way those clouds scurry past the moon."

The air got colder and the currents more swift. Finally the balloon entered the upper current and with a rush the bag and its dangling basket containing the men were swooped away by a gale going fifty-five miles an hour. Faster and faster they flew, as fast as a speeding express train, tearing through the air at a sickening rate. Down below, when the clouds separated, they could see the towns and villages spread out. At last, after almost two hours, a large city sent its thousands of twinkling messages up to the men in the clouds

"We were over Des Moines," said Leo Stevens, "but Des Moines didn't know it. There was a big storm raging over the city, and here we were caught in a whirlpool and held. Finally we got away and made our way back."

At 7 A. M., the travelers dropped down to the ground in Fort Omaha and demanded breakfast.

The students at Fort Omaha are getting as blase as their instructor. Thrills are a part of their daily existence and they are learning to take them calmly. They hope to get to France, where greater danger will add still more spice to their days.—*The Omaha Sunday Bee.*

Lafayette Fliers Officers of U. S.

American Field Headquarters in France—All American aviators now fighting in the French army were formally commissioned as officers in the United States Army aviation service Nov. 13. The famous Lafayette Escadrille of Americans was included.

Some of the new American fliers will continue temporarily with their present commands and under French direction until they are called upon for active service with the American expeditionary forces. A great many airmen, however, will join the American colors at once.

The transfer of this body of aerial fighters gives the United States a nucleus of veterans of the air which is expected to be of incalculable advantage when the American forces get into action.

Director of Steel Supply for Ward Industries Board

The following statement is authorized by the Council of National Defense:

Under and subject to the raw materials division of the war industries board of the Council of National Defense, J. L. Replogle, vice-president of the American Vanadium Co., will act as director of steel supply and will have charge of the distribution and be responsible for the prompt and proper execution of all orders for iron and steel, other than ordnance, for the United States and allied Governments.

Mr. Replogle will receive weekly reports from the iron and steel producers showing the tonnage of iron and steel of the various classifications on order for the United States and allied Governments, as well as domestic and foreign orders for general purposes. He will also keep informed as to mill capacities and mill production, and in case of retarded output, secure reasons therefor, and in conjunction with the manufacturers and the war industries board make every proper effort to remove obstacles which prevent maximum output of war necessities.

Mr. Replogle will at all times work in close harmony with the various departments of the Government, which will give him as much preliminary information as possible in order that material can be placed to the best advantage of all concerned and with due consideration with respect to giving mills the best operating conditions to permit maximum output at minimum cost so far as the Government necessities will allow.

Mr. Replogle will have all necessary steel statistical records to which the authorized representatives of the various Governments will have access.

Caproni Now Plans to Fly Across Ocean With 50 Passengers.

Rome.—Sig. Caproni, one of the inventors of the aeroplane now being tried out in the United States, is to seek new laurels.

"After the war," he said, "I intend to bulid a machine to carry fifty persons and to be capable of crossing the Atlantic. I even may attempt this some time in 1918.

"The machine will make the flight from Newfoundland, touching at the Azores and landing at Lisbon. It will be a five seater."



One section of the landing chassis of the huge Handley Page bombing machine.

Campaign To Speed Aeroplane Spruce

Portland, Ore.—Colonel Brice Disque, of the Army Signal Corps, was here to establish a government "spruce-speeding" bureau for the Pacific Northwest. He said he would launch a campaign to standardize and work to full capacity the Oregon and Washington lodging camps and mills, engaged in putting out aeroplane spruce.

Ten thousand men, he said, would be sent into the forests to cut timber and an endeavor would be made to produce ten million feet of spruce a month for aeropdanes for the United States and her allies.

Ford Gets $300,000,000 Aeroplane Contract

It was reported in a despatch to the New York *Sun* that a contract amounting to more than $300,000,000 for rush construction on aeroplane parts has been given to Henry Ford. The Ford factory in Detroit is now making aeromotor cylinders, is turning out a large number of parts for Liberty motor trucks and soon will be making equipment for merchant ships.

Practical Wireless Telegraph.

The author describes his book with some justification a "complete text book." It is designed to serve the purposes of the non-technical students and the practical telegraphists in securing an understanding of present day commercial wireless communication. It does not presuppose much general knowledge of the subject, and the early chapters are devoted to describing the fundamentals of electricty, electromagnetic induction, the dynamo, the motor, motor generator, batteries, etc. The author lays special stress on the importance of a thorough understanding of electrical circuits, and a considerable part of the book is devoted to describing the circuits of practical radio sets with explanations of the basic principles of the apparatus. The apparatus described is that in most common commercial use.

The would-be wireless operator will find especially interesting the guide for beginners in taking the examinations for Government license certificates. The book is illustrated with more than 500 photographs and drawing which clearly visualize the text. It is indexed with such attention to details that the volume will be valuable to wireless men or to the general reader as a work of reference.

Practical Wireless Telegraphy, Elmer E. Bucher. Obtainable at The Aeronautical Library, 280 Madison Avenue, New York City, for $1.65, which covers carrying charges.

Wardrop Lectures at Rochester

Before a very large audience in Convention Hall, Rochester, G. Douglas Wardrop, editor of AERIAL AGE, delivered a lecture describing the important part aircraft are destined to play in the great war, and aroused the local enthusiasm to a high pitch by eulogizinig the excellent part now being taken in production by the Taylor Instrument Company and the Eastman Kodak Co.

Mr. Wardrop also addressed the Y. M. C. A. war work luncheon under the auspices of the Chamber of Commerce, where he urged those present to support the association's work in the most enthusiastic way possible.

An Automobile Encyclopedia

The sixth and revised edition of Dykes work will be welcomed by a large and ever increasing audience. The work is justly termed in its title an encyclopedia. In the wide range of its subject matter and its detailed treatment it deserves such a classification. The present volume runs to upwards of 1000 closely printed pages and contains some 492 charts and inserts. The construction, operation and repairing of engines is treated in surprising detail. The discussion is always carried on in a clear, simple form, and explains every problem confronting an operator in caring for any make of car or gasoline engine. The reader may learn to master the construction and operation of all types of automobiles, engines, ignitions, carburetors, etc. The author draws upon an immense store of knowledge in preparing the work dating from the early days of the industry. Throughout the book the author had attempted to keep in view the practical side of the subject.

The book will be found invaluable to everyone interested in the general subject of motors. The completeness of the treatment renders it specially valuable as a book of reference. A very complete index enables one to turn quickly to any subject. The pages devoted to a Digest of Troubles give the cause and remedy of every complaint an engine is subject to, while the Repair and Adjustment subject is especially compete.

Dykes Auto and Gas Engine Encyclopedia. Obtainable at The Aeronautical Library, 280 Madison Avenue, New York City, for $3.25, which covers carrying charges.

NAVAL and MILITARY AERONAUTICS

Board to Meet at Philadelphia

A board of officers to consist of—Capt. Charles C. Jones Aviation Section, S. R. C., First Lieut. Frank N. Cordner, Aviation Section, S. R. C., and First Lieut. John P. Gallagher, Medical Corps, is appointed to meet at Philadelphia, Pa., for the purpose of examining applicants for commission in the Aviation Section, S. R. C. The above named officers will proceed from the Signal Aviation School, Chandler Field, Essington, Pa., to Philadelphia, Pa., and take station, reporting by telegraph upon arrival to the Chief Signal Officer of the Army for instructions.

Special Order 259

Officers of Medical Reserve Corps relieved from duty at Medical Officers' Training Camp, Fort Benjamin Harrison, Ind., and ordered to report to commanding officer, Signal Corps Training School, Selfridge Field, Mt. Clemens, Michigan, for duty with Aviation Section, Signal Corps: Capt. Howard W. Stuch, First Lieut. Harry E. Brown, First Lieut. John A. True.

The following named officers, now on duty at the places specified, are assigned to duty with the Aviation Section, Signal Corps, reporting by letter to the Chief Signal Officer of the Army, Washington, D. C.

MEDICAL RESERVE CORPS.

Capt. Donald T. MacPhail, Signal Corps Aviation School, Mineola, L. I., N. Y.
Capt. James A. Robertson, United States Aviation School, San Antonio, Texas.
First Lieut. Edward E. Collins, United States Aviation School, San Antonio, Texas.
First Lieut. Douglas S. Edwards, Physical Examining Unit, San Antonio, Texas.
First Lieut. Samuel R. Evans, United States Aviation School, San Antonio, Texas.
First Lieut. Orren P. Goodwin, U. S. Aviation School, San Antonio, Texas.
First Lieut. Denver F. Gray, Signal Corps Aviation School, Mineola, L. I., N. Y.
First Lieut. John H. Hall, Physical Examining Unit, Atlanta, Ga.
First Lieut. Joseph J. Livingston, Signal Corps Aviation School, Mineola, L. I., N. Y.
First Lieut. William A. Jennings, United States Aviation School, San Antonio, Texas.
First Lieut. Henry E. Luehrs, United States Aviation School, San Antonio, Texas.
First Lieut. Jefferson D. Motheral, United States Aviation School, San Antonio, Texas.
First Lieut. Cranz Nichols, United States Aviation School, San Antonio, Texas.
First Lieut. John R. Oswalt, United States Aviation School, San Antonio, Texas.
First Lieut. Carl Puckett, United States Aviation School, San Antonio, Texas.
First Lieut. D. Leon Sanders, United States Aviation School, San Antonio, Texas.
First Lieut. Bruno F. Sandow, Military School of Aeronautics, Berkeley, Cal.
First Lieut. Caleb O. Terrell, United States Aviation School, San Antonio, Texas.
First Lieut. Osco P. Sweatt, United States Aviation School, San Antonio, Texas.
First Lieut. Samuel T. Wells, United States Aviation School, San Antonio, Texas.

DENTAL RESERVE CORPS.

First Lieut. Gerald F. Stoodly, Military School of Aeronautics, Berkeley, Cal.

DENTAL CORPS.

First Lieut. Dale E. Repp, United States Aviation School, San Antonio, Texas.

Special Order 260

Medical Reserve Officers from medical officers' training camp, Fort Benjamin Harrison, Ind., assigned to duty with the Aviation Section, Signal Corps, at Signal Corps Aviation School, Wilbur Wright Field, Fairfield, Ohio, reporting by letter to Chief Signal Officer of the Army: First Lieuts. George H. Ramsey, Carlos C. Rozelle, Magnus I. Seng, Clair, L. Stealy and Joel E. Toothaker.

Capt. David Reeves, Signal Reserve Corps, relieved from duty in office of military attache, Mexico City, Mexico, and will proceed to Camp Alfred Vail, Little Silver, N. J.

Paragraph 227, Special Orders No. 221, War Department, September 22, 1917, relating to Capt. David Reeves, Signal Reserve Corps, is revoked.

Capt. Alexander W. Young, Signal Reserve Corps, to Camp Lewis, American Lake, Washington, for duty.

Medical Reserve Officers, from duty at medical officers' training camp, Ft. Benjamin Harrison, Ind., assigned to duty with Aviation Section, Signal Corps, at Langley Field, Hampton, Va.: First Lieut. William L. Connery, Edward L. Hazeltine, Frank W. Smythe, Walter C. A. Staffin and Clayton G. Woodhull.

Major Albert B. Lambert, Aviation Section, Signal Reserve Corps, rated junior military aviator, from July 24, 1917.

Capt. Eugene A. Lohman, Signal Corps, to duty with 8th Field Signal Battalion, at Presidio of Monterey, Cal.

Major Robert L. Barnes, Aviation Section Signal Reserve Corps, to Fort Sam Houston, Texas, for intelligence duty.

Aviation Section, Signal Reserve Corps Officers to Garden City, L. I., N. Y., duty at Aeronautical General Supply Depot at Concentration Camp: Second Lieut. Raymond C. Long, Herman M. Bause, Charles D. Loomis and Ralph E. Muehlman.

Major Charles T. Waring, Signal Corps, to assume charge of Signal Corps construction work at Langley Field, Hampton, Va.

Major Walter R. Weaver, Signal Corps, to Wilbur Wright Aviation Field, Dayton, Ohio.

Second Lieut. William E. Kapp, Aviation Section Signal Reserve Corps, to Kelly Field, South San Antonio, Texas.

Aviation Section Signal Reserve Corps officers to duty at School of Military Aeronautics at Princeton, N. J.: First Lieut. Harry A. Chandler, First Lieut. Gerard B. Lambert.

Capt. Clayton E. Emig, Aviation Section Signal Reserve Corps, to general supply depot, Middletown, Pa.

First Lieut. Louis A. McAbee, Aviation Section Signal Reserve Corps, to Hazelhurst Field, Mineola, L. I., N. Y.

Special Orders 258

First Lieut. Jay H. Cathers, Aviation Section, S. R. C., to South San Antonio, Texas, Kelly Field, for duty.

Leave of absence for seven days is granted to Lieut. Col. Joseph B. Douglas, Signal Corps.

First Lieut. Percy Pierce, Aviation Section, S. R. C., will proceed to this city and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Grover O'Neill, Signal Corps, will report in person to the Chief Signal Officer of the Army, for duty.



Some of the British women "Doing their bit" in the Whitehead Aircraft Factory, Surrey, England.



The photograph gives a clear view as to the manner in which the "swinging" wings of the Handley Page bombing machines are locked into place.

First Lieut. Robert F. Ellison, Aviation Section, San O. R. C., is ordered to active duty to South San Antonio, Texas, reporting to the commanding officer, Kelly Field, for assignment to duty.

Col. James B. Allison, Signal Corps, will proceed from the Presidio of Monterey, Cal., to the Presidio of San Francisco, Cal., on or about November 11, 1917, for the purpose of selecting certain candidates on the officers' training camp for commissions in the Signal Officers' Reserve Corps, and upon completion of this duty will return to his proper station.

First Lieut. G. Raymond Richman, Aviation Section, S. R. C., is relieved from further active duty.

Lieut. Col. William L. Patterson, Signal Corps, will report in person to the president of the mlitary aviator board and junior military aviator board of this city, for examination by the board, and upon completion thereof will return to his proper station.

Major Robert J. Bates,, Aviation Section, S. R. C., is assigned to active duty Garden City, L. I., N. Y., reporting to the commanding officer, aeronautical general supply depot and concentration camp, for duty.

Lieut. Col. Virginius E. Clark, Signal Corps, will appear before a military aviator board and junior military aviator board of Washington, D. C., for examination.

First Lieuts. Philip W. Fitzpatrick and Glenn P. Rodgers, Aviation Section, S. O. R. C., are assigned to active duty, reporting to the commanding officer, aeronautical general supply depot and concentration camp, Garden City, L. I., N. Y., for duty.

First Lieut. Francis J. Vine, Aviation Section, S. R. C., is assigned to active duty, reporting in person to the commanding officer, Hazelhurst Field, Mineola, L. I., N. Y., for duty.

The following named officers of the Medical Reserve Corps, now on duty at the places indicated, in addition to their other duties are assigned to duty as members of examining boards and as recruiting officers, to make such enlistments as may be authorized for the Aviation Section, Signal Corps, and for the Medical Department to be assigned to duty with the Aviation Section, Signal Corps:

Capt. Harold S. Arnold, New Haven, Conn., physical examining unit.

Capt. Arthur C. Bachmeyer, Cincinnati, Ohio, physical examining unit.

Capt. Charles S. Butler, Boston, Mass., physical examining unit.

Capt. George F. Cott, Buffalo, N. Y., physical examining unit.

Capt. George E. Frothingham, Detroit, Mich., physical examining unit.

Capt. Charles W. Kollock, Charlestown, South Carolina, physical examining unit.

Capt. William W. Laing, Toronto, Canada, Signal Corps Aviation School.

Capt. Robert Levy, Denver, Colo., physical examining unit.

Capt. William H. Roberts, Los Angeles, Cal., physical examining unit.

Capt. Frederick C. Simon, St. Louis, Mo., physical examining unit.

Capt. George W. Woodnick, Chicago, Ill., physical examining unit.

Capt. Frederick E. Woodruff, Mount Clemens, Mich., S. C. Aviation School.

First Lieut. Wilson M. Bassett, Fort Sam Houston, Texas, physical examining unit.

First Lieut. Conrad Berens, Jr., Rantoul, Ill., Signal Corps Aviation School.

First Lieut. Elbridge J. Best, San Francisco, Cal., physical examining unit.

First Lieut. Theodore S. Blakesley, Kansas City, Mo., physical examining unit.

First Lieut. Arthur N. Bobbitt, San Diego, Cal., Signal Corps Aviation School.

First Lieut. Joseph G. Coleman, Hampton, Va., Signal Corps Aviation School.

First Lieut. Charles E. Connor, Minneapolis, Minn., physical examining unit.

First Lieut. Roy Crook, Omaha, Nebraska, physical examining unit.

First Lieut. George S. Cunningham, Pittsburgh, Pa., physical examining unit.

First Lieut. Franklin E. Cutler, Cleveland, Ohio, physical examining unit.

First Lieut. Philip I. Frouds, Fairfield, Ohio, Signal Corps Aviation School.

First Lieut. John P. Gallagher, Essington, Pa., Signal Corps Aviation School.

First Lieut. Ben. C. Gile, Philadelphia, Pa., physical examining unit.

First Lieut. William W. Gill, Richmond, Va., physical examining unit.

First Lieut. John H. Hall, Atlanta, Ga., physical examining unit.

First Lieut. Charles W. Hyde, Washington, D. C., physical examining unit.

First Lieut. Bernard J. Larkin, Indianapolis, Ind., physical examining unit.

First Lieut. John G. Jennings, Boston, Mass., physical examining unit.

First Lieut. Louis Levy, Seattle, Washington, physical examining unit.

First Lieut. Julius C. Oram, Portland, Me., physical examining unit.

First Lieut. Gaston W. Rogers, Birmingham, Ala., physical examining unit.

First Lieut. Fedor L. Senger, New York, N. Y., physical examining unit.

First Lieut. William S. Shimer, Urbana, Ill., Military School of Aeronautics.

First Lieut. Edward R. Sibley, Ithaca, N. Y., Military School of Aeronautics.

First Lieut. James B. Stanford, Memphis, Tenn., physical examining unit.



The two place pusher type De Haviland Scout. One of the successful British warplanes.

First Lieut. Martin H. Urner, Princeton, N. J., Military School of Aeronautics.

Given Antiaircraft Duty

Capt. Alexander Macomber, Engineer Reserve Corps, in addition to his other duties, is assigned to the command of the Provisional Antiaircraft Searchlight Detachment and will report in person without delay to the commanding officer, Washington barracks, for assignment to duty.

Special Orders 263 and 264

So much of paragraph 44, Special Orders 254, War Department, Oct. 31, 1917, as directs First Lieut. Harold D. Hynda, Aviation Section, S. R. C., to proceed to Garden City, Long Island, New York., for duty is amended so as to direct First Lieut. Harold Hynda to report to the Chief Signal Officer of the Army for duty.

A board of officers to consist of—Major Norman J. Boots, junior military aviator, Signal Corps; Major Leo G. Hefferman, junior military aviator, Signal Corps and Capt. Courtney P. Grover, Medical Reserve Corps, is appointed to meet at Fairfield, Ohio, for the purpose of examining such officers as may appear before them to determine their fitness for the rating as military aviator.

Capt. John S. Phipps, Signal Corps, to duty at School Military Aeronautics, Cornell University, Ithaca, N. Y., for duty.

Lieut. Col. John C. Groome, Signal Corps, to Chief, War College Division, General Staff.

Second Lieut. Herbert H. Green, Av. Sec. S. R. C., to Garden City, Long Island, N. Y.

Capt. Edwin E. Newbold, Fourth Nebraska Infantry, to duty at Signal Corps Aviation School, Rockwell Field, San Diego, Cal., to complete his course in aviation.

First Lieut. James A. McDevitt, Jr., Signal Corps, to Army Balloon School, Fort Omaha, Nebraska.

Capt. Rex R. Gardner, Engineer Reserve Corps, reporting to Signal Corps at Portland, Oregon, for assignment to duty.

Capt. William A. Scruton, Medical Reserve Corps, to duty in charge of the Physical examining unit Aviation Section, Signal Corps, New York, N. Y.

Capt. David H. Webster, Medical Reserve Corps, relieved from duty in charge of physical examining unit Aviation Section. Signal Corps, New York, and assigned to duty as member of the examining board and recruiting officer at 104 Broad Street, New York City, N. Y.

Rules on Army Salute

Washington.—The officers and enlisted men of the army in uniform will stand at attention when the national anthem is played, but when they are uncovered they will not salute. There has been some misunderstanding regarding the custom to be observed by officers and men under the provisions of the army regulations, and for that reason the War Department today issued this announcement:

"Attention has been called to instances of misunderstanding with regard to the form of respect to be paid by army men to the national anthem, when played in theatres and other public places. The War Department calls attention to the regulation which provides that during the playing of the national anthem, officers and enlisted men in uniform, when uncovered, stand at attention without saluting."

The army regulations of Aug. 10 last deal with the subject in this language:

"Whenever the national anthem is played at any place when persons belonging to the military service are present, all officers and enlisted men not in uniform shall stand at attention facing toward the music (except at retreat, when they shall face the flag.) If in uniform, covered, they shall salute at the first note of the anthem, retaining the position of salute until the last note of the anthem. If not in uniform and covered, they shall uncover at the first note of the anthem, holding the headdress opposite the left shoulder, and so remain until the close, except that in inclement weather the headdress may be held slightly raised."

First Lieut. Eugene W. R. Williams, Medical Reserve Corps, is relieved from duty at the school for Aerial Observers, Fort Sill, Oklahoma, and will proceed to Fort Worth, Texas, and report in person to the commanding officer, Signal Corps Aviation School, for duty and by letter to the Chief Signal Officer of the Army, Washington, D. C.

Major Atilio M. Caccini, Medical Reserve Corps, is relieved from duty at the Signal Corps Aviation School, Fort Worth, Texas, to take effect upon the arrival at that place of First Lieut. Eugene W. R. Williams, and will proceed to Garden City, Long Island, New York, and report in person to the commanding officer, concentration camp and supply depot, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

First Lieut. George C. Kenney, Aviation Section, Signal Reserve Corps, is ordered to

active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, New York, for assignment to duty.

First Lieut. Martin T. Chamberlin, Signal Corps is assigned to active duty and will report in person to the commanding officer, Selfridge Field, Mount Clemens, Michigan, for duty.

Special Orders, 262 and 263

Capt. Robert C. Dunbar, Signal Corps, will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Loyal D. Palmer, Signal Corps, is assigned to active duty and will report in person to the commanding officer, Army Balloon School, Fort Omaha, Nebraska for assignment to duty.

First Lieut. John J. Dillon, Signal Corps, is assigned to active duty and will report in person to the commanding officer, Army Balloon School, Omaha, Fort Omaha, Nebraska for assignment to duty.

First Lieut. Kenneth O. Shrewsbury, Signal Corps, is ordered to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty.

Orders heretofore issued directing First Lieut. John W. Frewer, Aviation Section, S. R. C., to proceed to Morrison, Virginia and report in person to the commanding officer, aviation concentration camp, for duty are revoked.

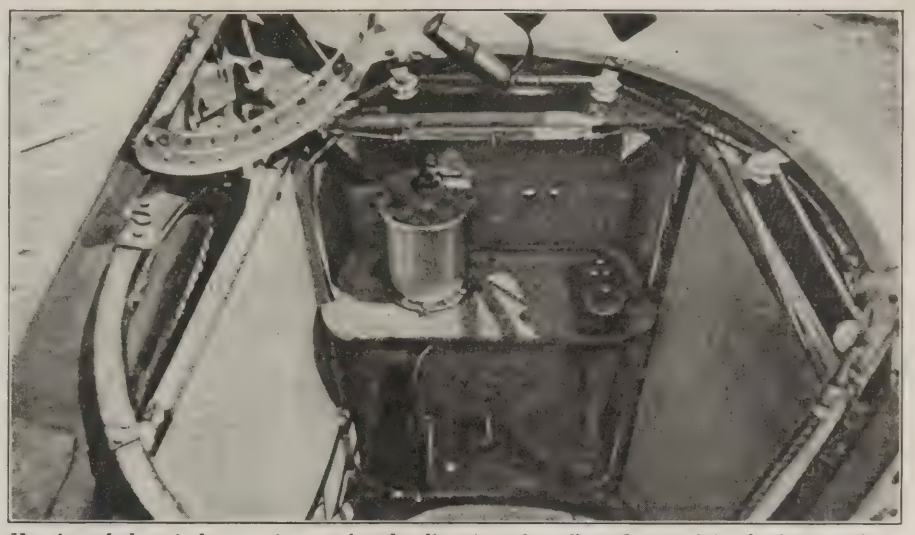
So much of paragraph 170, Special Orders. No. 257, War Department, November 3, 1917, as relates to Major Thurman H. Bane, junior military aviator, Signal Corps, is amended to read Lieut. Col. Thurman H. Bane, junior military aviator, Signal Corps.

The appointments of Homer B. Black, and Kenneth B. Haines, Signal Corps, National Guard, United States (Pennsylvania), as first lieutenants with rank from October 31, 1917, is announced.

The following named officers of the Medical Reserve Corps, are relieved from duty at the medical officers' training camp, Fort Riley, Kans., and will proceed to the places specified and report in person to the commanding officer thereof for duty with the Aviation Section, Signal Corps, and by letter to the Chief Signal Officer, Washington, D. C.: Capt. Chester H. Clark, Signal Corps, Aviation School, Rantoul, Illinois; First Lieut. Paul H. Fowler, Signal Corps, Aviation School, Rantoul, Illinois; First Lieut. Carl C. Fuson, Signal Corps, Aviation School, Rantoul, Illinois; First. Lieut. John W. Thompson, Signal Corps, Aviation School, Mount Clemens, Michigan; First Lieut. Justin J. Young, Signal Corps, Aviation School, Mount Clemens, Michigan.

So much of paragraph 104, Special Orders 254, War Department, Oct. 31, 1917, as relates to Capt. Charles B. Dillingham, S. R. C., is amended to read so as to direct him to report by letter to the Chief, War College Division, for assignment to duty with the station in New York City, N. Y.

The board of officers appointed by paragraph 27, Special Orders 99, War Department. April 30, 1917, to meet at Essington, Pa., for the purpose of examining applicants for commission in the Aviation Section, Signal Reserve Corps, is dissolved.



Housing of the wireless equipment for the direction of artillery fire used in the big warplane shown on this page. (*Official Photo*)

Special Orders 261

Second Lieut. Albert H. Hastorf, Jr., Signal Reserve Corps, is assigned to active duty and will proceed to Hoboken, New Jersey, reporting in person to the commanding general, port of embarkation, for assignment to duty as assistant to the signal officer at that place.

Major Ray C. Hill, Signal Corps is relieved from his present duties and will proceed to Portland, Oregon, reporting in person to Lieut. Col. Brice P. Disque, Signal Corps, for duty.

Major Darwin P. Fullerton, Signal Reserve Corps, is relieved from further active duty.

The following named second lieutenants, Cavalry Reserve Corps, will proceed to Toronto, Canada, reporting to the commanding officer, Signal Corps School for Aerial Gunnery, Camp Borden, for assignment to duty: Arthur V. Brown, Richard J. Kirkpatrick, Edmund P. Pincoffs.

Capt. Earl F. White, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., reporting in person to the Chief Signal Officer of the Army for assignment to duty.

The following named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Indiana, and will proceed to Mineola, Long Island, New York, reporting in person to the commanding officer, Signal Corps Aviation School, Hazelhurst Field, for duty with the Aviation Section, Signal Corps, and by letter to the Chief Signal Officer, Washington, D. C.: First Lieuts. Paul E. Betwski, Waldo C. Farnham, Charles C. Fishburne, Donald D. Johnston, Daniel M. MacDonald, James S. Mariner, Rudolph S. Reich, Herman G. Rosenblum, Clarence J. Schirack, John W. Tippie.

The following named officers of the Aviation Section, S. R. C., are announced as on duty requiring them to participate regularly and frequently in aerial flights from the dates after their respective names: First Lieuts. William F. Jones, Oct. 25, 1917; Paul C. Wanser, Oct. 1, 1917.

(*Continued on page* 477)



The latest machine equipped for the direction of artillery fire by wireless The wireless equipment used in these machines is powerful enough to transmit a distance of ninety-four miles if necessary. They can both transmit and receive. The electrical force is supplied by a small dynamo which receives its power from a screw placed in front of the machine and actuated by the motion of the air. (*Official Photo*)

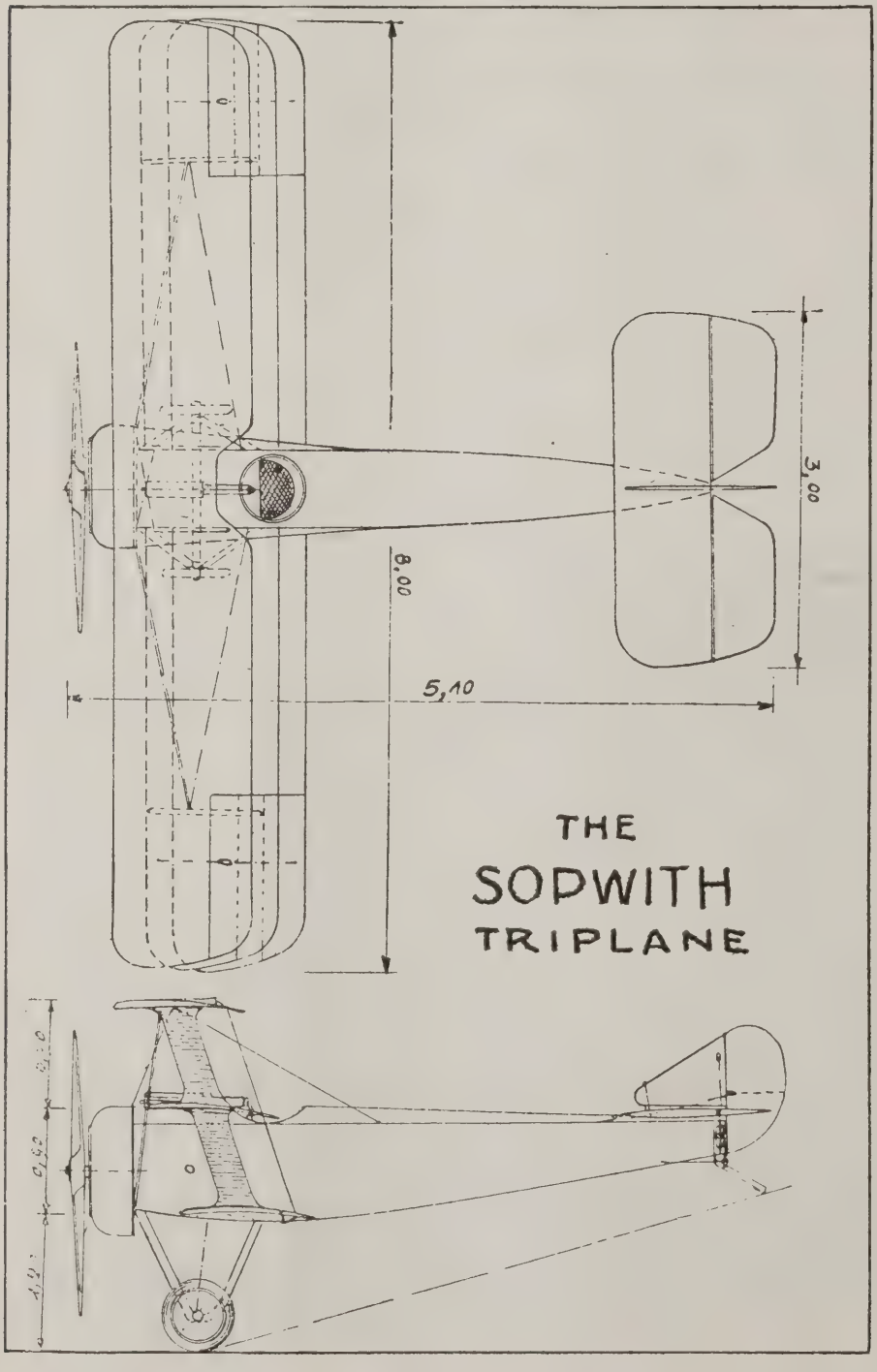
THE SOPWITH TRIPLANE

IN the August issue of "The German Airmen's Journal" the well-known writer of aerial matters, Engineer Roland Eisenlohr, writes of the Sopwith triplane to this effect:

"Among the new aeroplanes that the war has created the Sopwith triplane holds a special position, being the first triplane to be employed on practical purposes. This type was out of date since the little successful experiments in the early years of aviation by Hans Grade in Germany during 1917, by A. V. Roe in England, and by Goupy in France, and one prophesied the type no big future. Since the American Curtiss aircraft works had at the end of last year for the first time again turned out a triplane, Sopwith has likely felt himself incited to produce too a triplane.

"The cause of falling back on this type may be foremost the small span which is made possible thereby. Perhaps Curtiss had from the start proceeded in the right design of the triplane type, triplane construction consists therein that the unfavorable turning it





out almost wireless. Another advantage of the relation of the chord to the span turns here out better, as there is now a triple span owing to the addition of a third plane; for though the proportion shall not be less than 1.6, it has in most cases of aeroplanes of very small span to be reduced. Thus the chord amounts in the Sopwith triplane to little over 1 metre by a span of 8 metres.

"The increased head resistance of the planes is neutralized by the employment of single struts and simplified wiring. By employing the Curtiss strut construction wiring is in but one level, as is evident from the side view. By the smaller loading of the planes the main spars can finally be built pretty light and allow yet comparative large free spans, the Sopwith triplane about 2.75 metres with a free end of 1.40 metres. The weight of the total planes should therefore even be scarcely higher than biplanes of the same dimensions.

"Perhaps the plane arrangement affords the pilot a better view, as the middle plane lies in the level of the head, and the top and bottom planes hide less of the range of view by their smaller chord than the normal planes of small biplanes.

"Sopwith has a diagonal wire between the top and bottom strut junctions (see the below illustration), which we do not find in Curtiss, as mentioned already. While the two strain wires pass in front of the middle plane the opposite wire is pulled through the latter. A forward inclined diagonal wiring is arranged between the two inner struts, rising on the body sides, while the wires leading behind are not crossed. As evident from the scale drawings the planes are staggered about 25 per cent at an intermediate space of 0.9 metre and all carry ailerons, connected by vertical steel bands, at their ends.

"The triplane has a small dihedral, but no arrow shape of the planes. The body carries a 110 h.p. Clerget rotary engine in front, housed in a round cowl, overhanging the body for the purpose of diverting the air.

"The body is of square section, passing over in the rounding of the motor housing forward by means of light wooden ribs to both sides. The body has width of 0.7 metre and slenders backwards to a vertical edge to which the rudder is attached with a fin in front.

"The elevator is built in two parts and has before it a fixed tail plane, 3 metres broad, the angle of which can be varied during the flight as in all Sopwith aircraft.

"The area of surface of the Sopwith triplane amounts to 27 square metres, the weight full loaded to about 670 kilos, the load of the planes being thus only 25 kilos per square metre. A high speed and a very good climb can no doubt be attained by this small load. Exact news of performance have not been published so far.

"The triplane is turned out both as single-seater and as two-seater, and is always armed with a fixed gun in front, lying on the body in the two-seated model, with a further turnable one for the observer, when the weight full loaded is increased by about 100 kilos.

"As in all Sopwith aeroplanes the undercarriage consists of two steel knees and of a divided wheel shaft, the links of which are tightened to the body.

"Up to this date the Sopwith triplanes are not much represented at the front and only about five or six are shot down each month. Whether it shall be engaged at the front in quantities depends likely from the experiences gained of it on active service, of which the foreign press has not yet reported."

THE DEFINITION OF PROPELLER PITCH

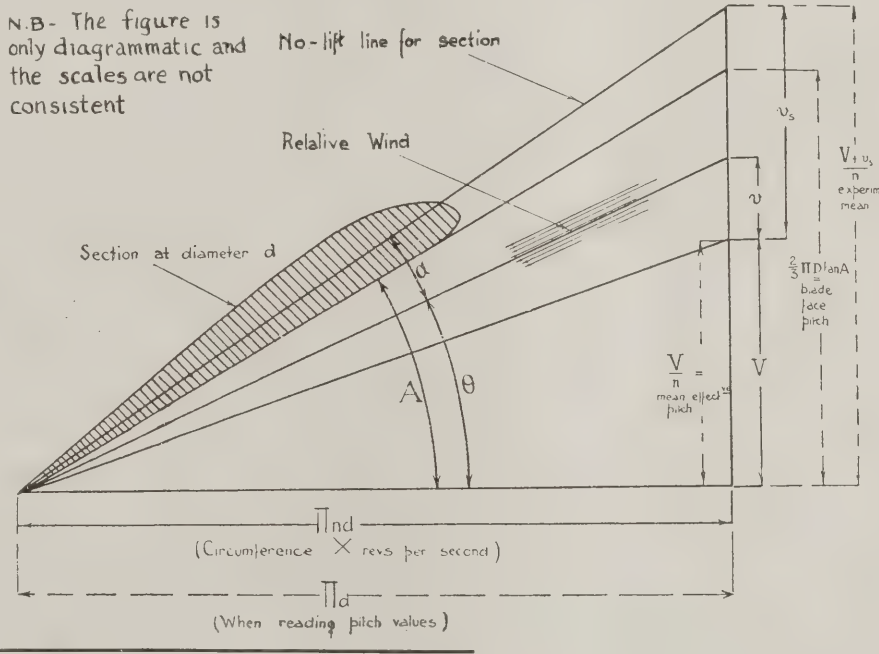
By E. P. KING, B. Sc. (Eng.) Lond.

THE term pitch as ordinary used in connection with an airscrew is not such a precise and clearly defined quantity as the pitch of an ordinary engineer's screw thread. Of course, the term can be made to have a perfectly definite meaning by standardizing the method of measurement or by suitably qualifying the term so as to leave no doubt as to what is meant. It is to be feared that very often the term has been used in a very loose and unscientific way, and there has been no little confusion and ambiguity as a result. In speaking of the pitch of a bolt and nut no uncertainty is likely to arise, and we are not likely to be misunderstood as to the actual quantity referred to. It is the *advance-per-turn* of the screw measured in an axial direction —the values being in substantial agreement, whether measured on the screw itself or by actually driving the bolt through the nut. In the case of a screw working in air, however, we are concerned with very different conditions from those found in a rigid combination such as we have just instanced. Air is a highly rarified medium, the density being only one-eight hundredth that of water, and one-six thousandth that of steel. A *perfect liquid* is one whose *molecules* are perfectly free to move over one another with the slightest disturbing force—and air approaches very near to such an ideal liquid. With a screw working in such an elastic and accommodating medium it will not be surprising to find a certain amount of air slip beneath the blades so that the space covered per revolution is always something less than that represented by the geometric proportions of the screw blade. The axial space covered by a propeller for that the incoming air is given an added velocity in passing through the propeller disc. At zero slip no additional velocity and no rearward momentum is imparted to the incoming air stream, and as a consequence the thrust will be zero and there will be no true wake stream beyond that due to skin friction. The advance per revolution at which no thrust is obtained is termed the *mean experimental pitch* or *zero thrust pitch* of the propeller. It is a value found experimentally by artificially driving the screw through the air at increasing velocities till the point is reached at which there is no thrust. The experiment is usually done on a large whirling arm or in a wind tunnel, but an approximate value can be found quite easily by placing the estimated no-lift line on the blade section at two-thirds full diameter, this being at, or near, the center of pressure of the blade. Its value will vary slightly along the blade, but a very good approximation to the experimental value may be found by taking the section thus defined as a criterion.

The geometrical *blade pitch face* is the avial span of one twist of a helical line of constant angularity and radius, each revolution is termed its *mean effective pitch.* It is a function of the thrust at any instant and varies with each manœuvre of the pilot. Thus under climbing conditions the effective pitch may drop to 50 per cent. of its value in level flight, the slip, of course, increasing at the same rate. An analogous case may be found in the slip of an ordinary bolt and not as often happens in driving against a heavy load. In the case of the airscrew, however, the thrust is obtained *by reason of* the slip of air under the blades, so equal to that at the section taken. The fact that only a small fraction of a complete twist actually exists in the aerial propeller does not affect the argument as the pitch is quite independent of the blade width, but is a function only of the angle and radius of rotation. It usually varies along the blade and in most cases gets greater towards the boss, so that the blade face is not part of a true helix. It is necessary then, to state precisely the section at which measurement is to be made. The general rule is to take the blade angle at two-thirds full propeller diameter as a basis for calculation. The value so found is the *blade pitch* or simply *the pitch,* as ordinarily referred to by propeller makers and dealers, and it is the figure stamped on the boss. It is very important to remember that this is a purely geometrical quantity, depending only on the angles and proportions of the blade, and is not connected in any precise way with the effective pitch or mean experimental pitch.

The following is a key to the symbols used in the figure:

V = translational velocity (ft. per sec.).
v_1 = inflow velocity forward of blades.
v_2 = additional velocity rearwards.
v_s = slip velocity.
D = full diameter of prop.
d = diameter at any section.
n = number of revolutions per second.
α = angle of attack between no lift line and direction of relative wind.
Θ = helix angle of relative incoming air.
A = blade—face angle at any section.
P_e = mean effective pitch $= \frac{V}{n}$
P_o = experimental mean pitch or zero thrust pitch.
Pt = blade face pitch $= \frac{2}{3} \pi D \tan A$.



MILITARY AERONAUTICS

Special Orders 264 & 265.

Previous orders relieving Capt. David Reeves, Signal Reserve Corps, from duty in the office of the military attache, Mexico City, Mex., and directing him to proceed to Little Siover, N. J., are amended to read as to direct Capt. Reeves to proceed via. Washington, D. C., to Little Silver, reporting on arrival at Washington, D. C., to the Chief Signal Officer of the Army for temporary duty.

First Lieut. George M. Palmer, Signal Corps, is assigned to active duty and will report in person to the comanding officer, Kelly Field, for assignment to duty.

Under the provision of an act of Congress approved July 24, 1917, John A. Paegelow, Signal Corps, is rated as a junior military aeronaut, to date from Oct. 19, 1917.

Major Henry B. Hersey, Aviation Section, S. R. C., is rated as a junior military aeronaut from July 24, 1917.

Capt. George F. Campbell, Signal Corps will proceed from Toronto, Canada, to Fairfield, Ohio, reporting in person to the president of a board of officers appointed to meet for the purpose of examining officers as may appear to determine their fitness as a military aviator or junior military aviator, upon completion thereof will return to his proper station.

Sergt. First Class Richard H. Greyfield, Aviation Section, Signal Corps, is announced as being rated as an aviation mechanic to date from November 9, 1917.

Sergt. William H. Brown, 1st Oklahoma Infantry, now at Chanute Field, Rantoul, Ill., is transfered as private first class to the Aviation Section, Signal Corps, and is assigned to duty at his present station.

First Lieut. Alfred M. Henderson, S. O. R. C., is assigned to active duty and will proceed to Camp Alfred Vail, N. J., reporting in person to the commanding officer for duty.

Capt. William R. Van Sant, United States Army, retired, is relieved from duty at the Signal Corps, Aviation School, Rantoul, Ill., and will proceed to his home, and upon arrival there report by telegraph to the Adjutant General of the Army. Captain Van Sant is relieved from active duty, to take effect upon his arrival at his home.

Second Lieut. H. Shailer Dow, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aeronautical general supply depot.

First Lieut. Frank E. Evans, Signal Corps, is assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the comanding officer, aeronautical concentration camp, for duty. The travel directed is necessary in the military service.

AVIATION ENGINE DEVELOPMENT

By E. H. SHERBONDY

THE first mechanical flight was made in October, 1897, at Satory, France, by M. Ader, a French electrician and scientist, and was witnessed by a delegation of scientists appointed by the French Minister of War. It is said that the conditions under which this flight was made were most unfavorable, the wind being of sufficient strength to have made it difficult for modern aviators to fly. Nevertheless, Ader succeeded in flying some 350 yards. The Ader machine was a monoplane with wings of bat-like form, and was the prototype of a modern plane in a number of particulars, in that the landing gear was mounted on wheels as is now conventional in land-type machines. It was driven by two four-bladed propellers and arranged as a tractor. The power plant was steam, with total weight of 6¼ lbs. per horsepower. The engines alone weighed slightly over 2 lbs. per horsepower.

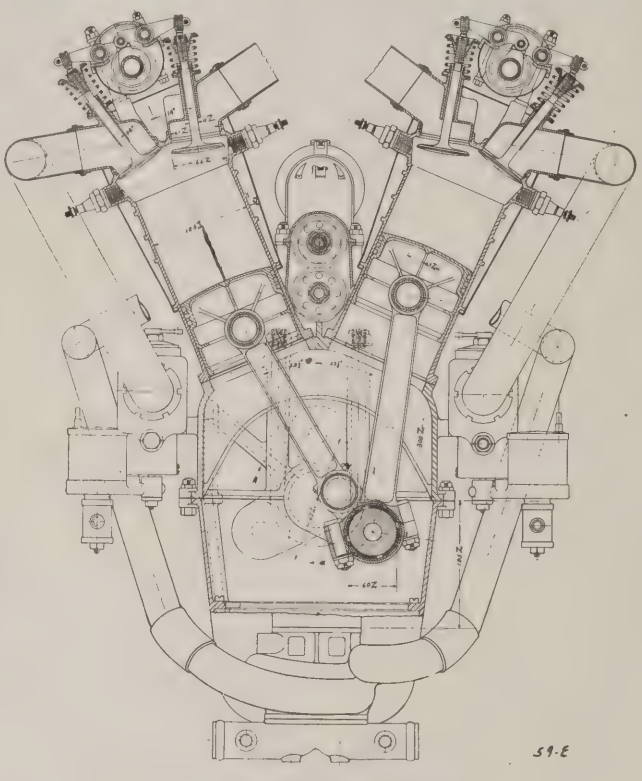
With the exception of the Wrights in America, Santos-Dumont was the next aviator to succeed in flying, which he did in a small machine called the Bagatelle, in August, 1906. From this time on a considerable interest was manifested in aviation, and in 1907 we find the names of Leon De Lagrange, Farman, Robert Ernault Pelterie, De la Vaux, Breguet and Bleriot. These men gave aviation its impetus in France, and each of the names is connected with modern ventures. The actual invention of various types of machines which are now used dates back as far as 1450, to Leonardo da Vinci and Dante de Perouse. Of course, every one is familiar with the names Langley, Lilienthal, Chanute and the Wrights. The contributions made by these men to the development of aviation at a time when the whole idea of flying was laughed at are of inestimable value.

Early French Development

The various French automobile manufacturers were called upon in 1906, 1907 and 1908 to construct light engines for aeroplanes, and the first of these followed closely the design of the type of automobile engine then in use. These engines soon proved unsatisfactory.

There then came a period of development during which many different types were built and tested, most of which would now be considered freaks, such as the Beck engine, which had pistons oscillating in a ring-formed cylinder, the diameter of the ring being about 30 in. The mechanical construction of such a device is exceedingly difficult.

The first good flying engine in France, the E. N. V., was built in two different sizes (50 and 80 h.p.) and was very much like the modern eight-cylinder automobile engine, except that the cylinders were cast individually and had electrolytically deposited water-jackets. The workmanship on these engines was equal to the finest that has since been seen, and their performance made possible numerous short flights of many aviators between 1907 and 1910.



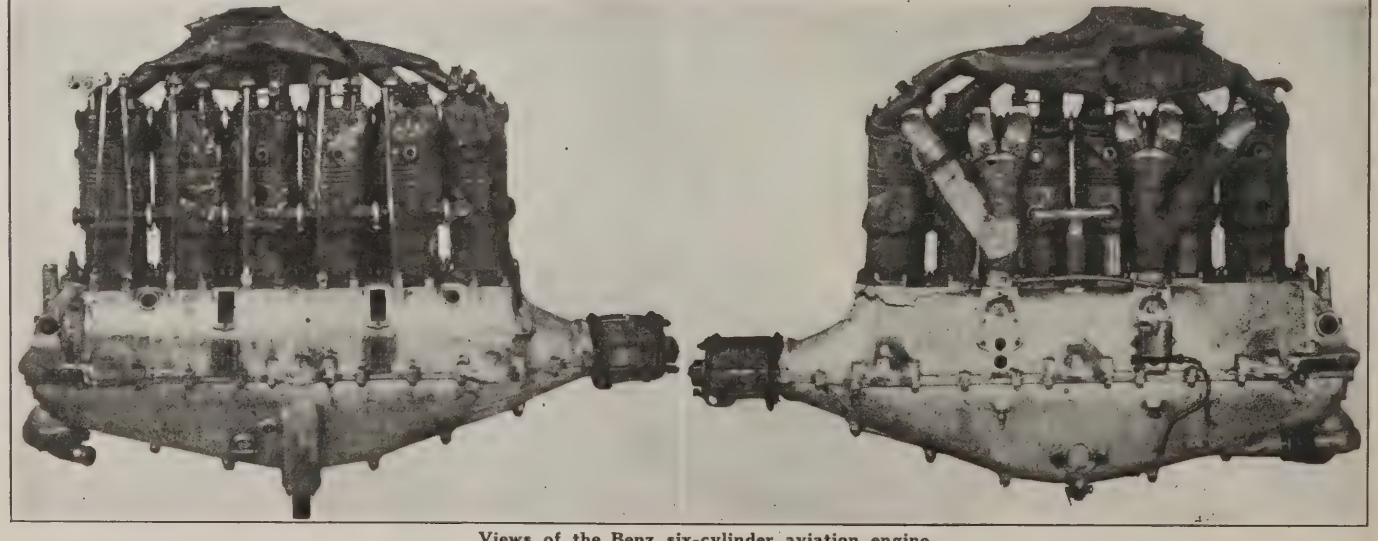
Cross section Renault twelve-cylinder engine

The Antoinette engine was also developed in this period, in eight, twelve, sixteen and twenty-four cylinders. The engine fairly successful, and was also of very light weight. It had the peculiarity of not utilizing a carbureter, but had individual fuel-feed lines piped to the cylinders immediately above the inlet valves, which were of the automatic type. This construction was of much lighter weight than a carbureter and intake piping would have been, and I believe should be returned to.

Aviation engines were also built by Panhard, Renault, Mores and Gregoire. The only one of these designs which was followed up before the opening of the war was the Renault V-type air-cooled engine, which was built in the form of a V of four cylinders. Later this construction was extended to eight and twelve cylinders. Reports of tests of these and other aviation engines were published in the official bulletin of the Automobile Club of France in 1909-1914, and some of them showed very good results. The Renault and Panhard companies both built water-cooled, steel-cylinder engines as early as 1908, and were thoroughly aware of the advantages of the steel construction at that time.

Difficulties of Construction

Owing to the fact that the power required was scarcely ever more than 80 and usually was 50 h.p., the aviation-engine designers of this early period were confronted with vastly greater difficulties than are our modern construc-



Views of the Benz six-cylinder aviation engine

tors. None of the stationary-cylinder types was reduced in weight below 3 lbs. per h.p. except the Gnome engine, which appeared in 1908, and was 30 per cent lighter than any other engine of that period, weighing only 2 lbs. per h.p. and had an output of about 35 h.p.

In October, 1909, Farman succeeded in flying three hours and four minutes with a Gnome engine. It was in this year that Glenn Curtiss went to France and astounded the world by carrying off the Gordon Bennett Cup with a Curtiss biplane driven by a Curtiss 3¾ by 3¾-in. engine. This engine is said to have weighed 200 lbs. and gave 35 h.p. at 1,000 r.p.m.

In 1909 Louis Bleriot succeeded in flying across the Channel in a Bleriot monoplane driven by a three-cylinder 25-h.p. Anzani engine. The flight was made in barely one-half hour, and it was immediately after this that the British War Office first became interested in the military possibilities of

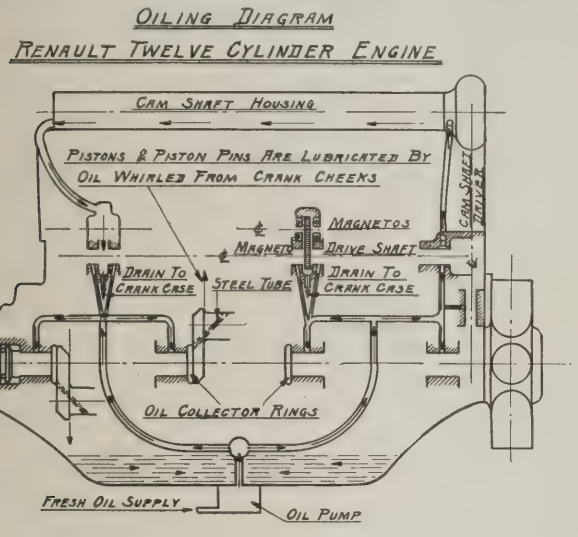


FIGURE 2-A

heavier-than-air machines. Shortly after Lord Northcliffe organized the £5,000 *Daily Mail* Contest Prize, won by Colonel Cody for a flight from London to Manchester.

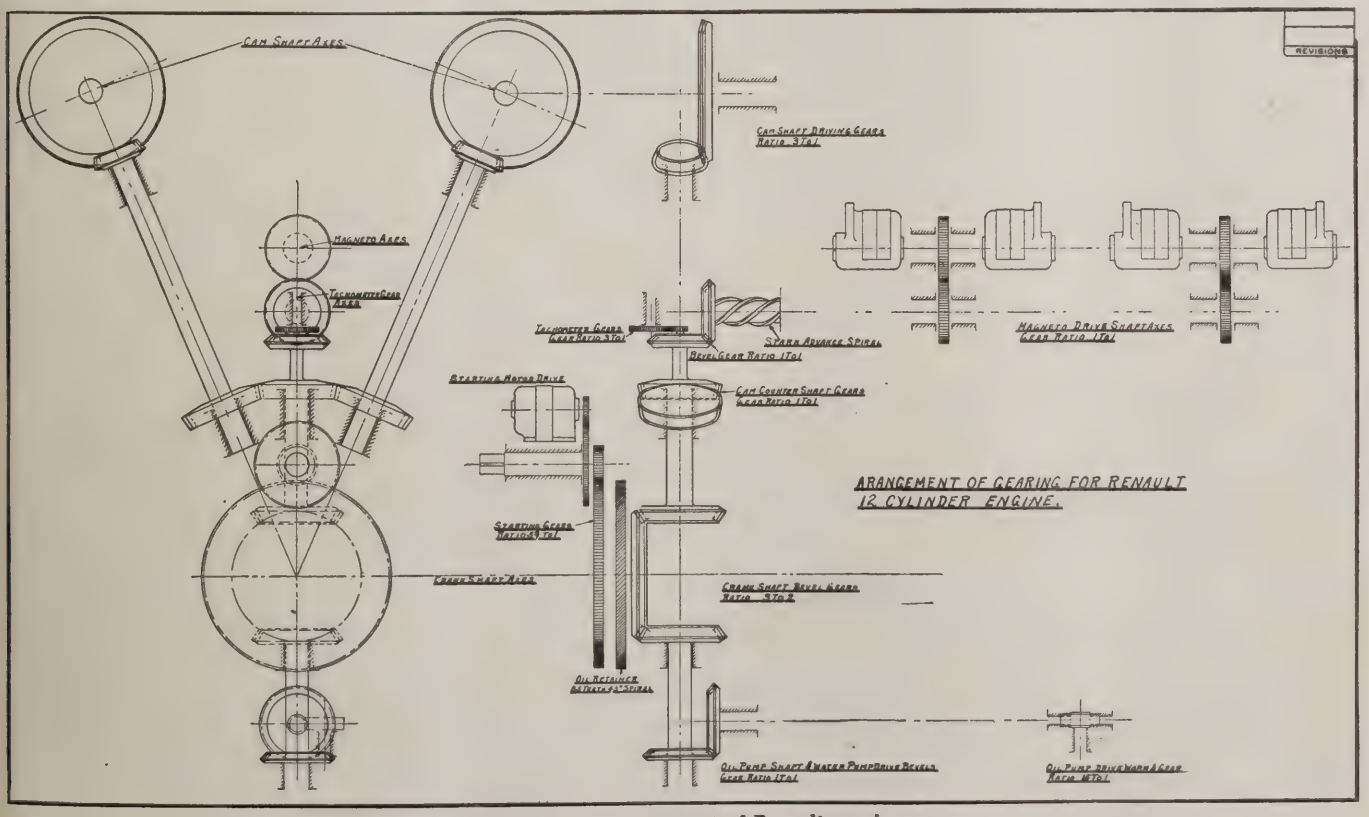
From this time on considerable interest in aviation was manifested in all European countries. Each of the various governments took it upon themselves not only to investigate the military possibilities of aviation but also to afford substantial support to the builders of aeroplanes and aeroplane engines. This is particularly true of Germany, where in 1913 the Kaiser Prize Contest for the best aviation engine that could be developed was held. In addition to prize contests, substantial subsidies were arranged for firms capable of building aviation engines, and this not only stimulated but made possible the development of such engines as the Mercedes and Benz in Germany.

We unfortunately have regarded the aeroplane as a sort of curiosity in this country, and it is only now that we are commencing to appreciate its military value, and only a small percentage of the people with whom I have talked seem to think there is possible any real commercial use of the aeroplane. Fortunately, this view is not held by everyone, and



Cylinder head of Renault twelve

while it is yet impossible to say in what direction the aeroplane will be most used in times of peace, it is my own belief that aerial transit will be developed within the next ten years so that it will be possible to travel with all the security and comfort of a modern Pullman car and with an enormous



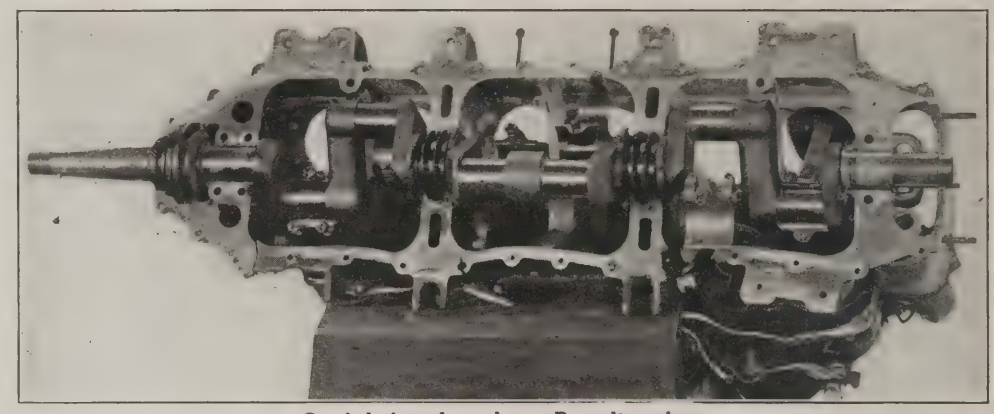
Diagrammatre arrangement of Renault gearing

saving of time. Doubtless before this time we shall have aerial mails.

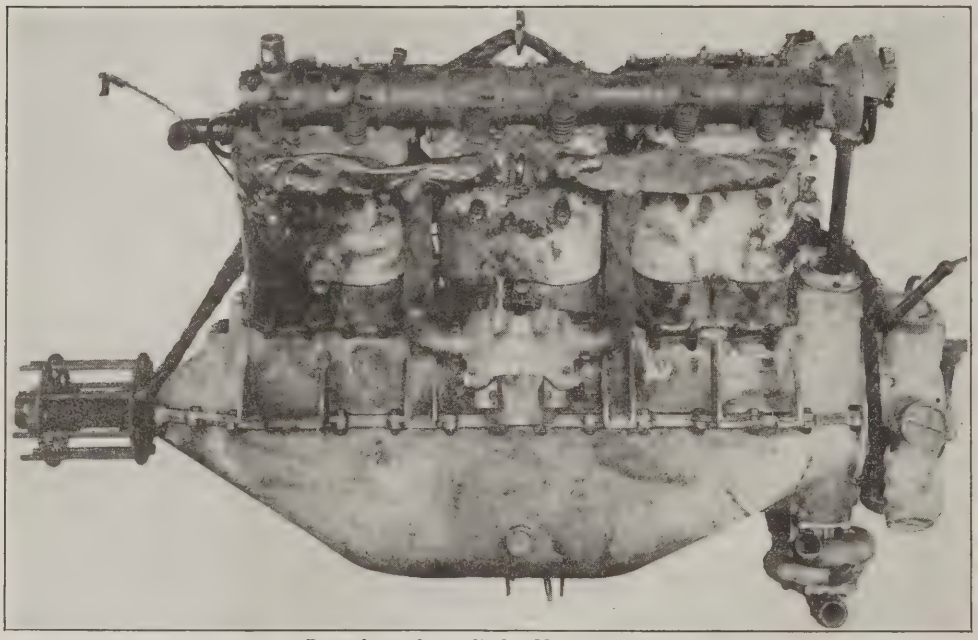
Our immediate concern is not, however, with either the past or future of aerial travel for sport or pleasure but with the grim business of building planes and engines for war. That a real task is ahead of us to develop satisfactorily aviation engines must be apparent to anyone who has reviewed, in even a casual way, the happenings of the last three of four years.

The size of the planes and the speed have increased by leaps and bounds during the period of the war. The facility with which man now flies is almost equal to that of birds. The largest sized successful aeroplane engine built up to 1909 was the 100 h.p. Antoinette. This year planes have been flown with a total of 1,700 h.p.

It was my good fortune to secure from Baron Charles Huard two of the aviation engines which were shot down in France during the last year. These I have had dismantled and can now give the full particulars of a 170 h.p. Benz and of a twelve-cylinder engine of the Mercedes type, which was probably built by Renault.



Crankshaft and crankcase Renault engine



Renault twelve-cylinder V-type engine

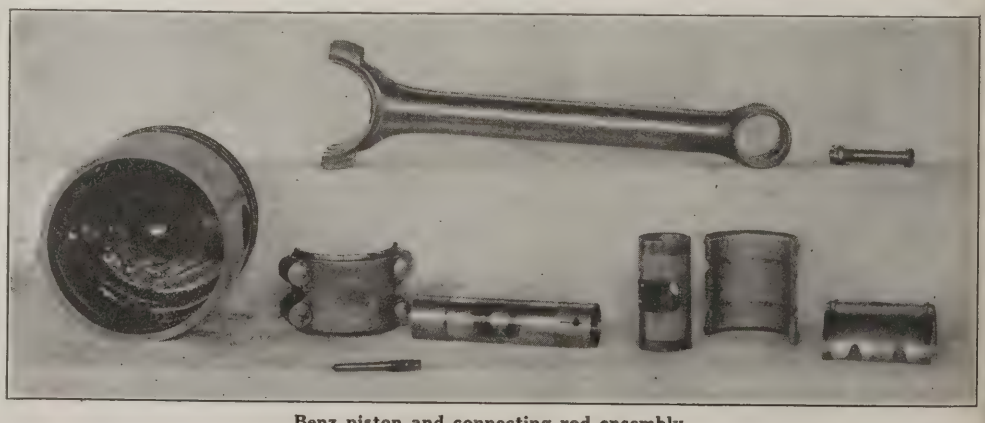
Mercedes Engine

The 150 h.p. six-cylinder Mercedes has 140 mm. bore and 160 mm. stroke. This type won all the important places in the Kaiser prize contest with the exception of the first prize, which went to the Benz. The Mercedes Company started with six smaller sized cylinders, namely 105 mm. bore and 140 mm. stroke. The principal features of the design are forged steel cylinders with forged steel elbows for gas passages, pressed steel water-jackets, which when welded together form the cylinder assembly, the use of inclined over-head valves operated by means of an overhead camshaft through rocker-arms, which multiply with the motion of the cam. By the use of steel cylinders, not only is the weight greatly reduced, but distortion through unequal sections, leaks and cracks are entirely avoided. The construction is necessarily very expensive. It is certainly a sound job. In the details of this construction there are a number of important things, such as finished gas passages, water-cooled valve-guides and a very small mass of metal, which is water-cooled, surrounding the spark plug. It is necessary to use very high compression in aviation engines in order to secure high power and economy, and owing to the fact that they are worked at nearly their maximum, the heat flow through the cylinder piston and valves is many times higher than that encountered in automobile engines. It has been found necessary to develop special types of pistons to carry the heat from the center of the head in order to prevent preignition.

In the Mercedes engine the pistons have a drop-forged steel head, which includes the piston pin boss. This head is screwed into a cast iron skirt which has been machined inside to secure uniform wall thickness.

The carbureter used on this 150 h.p. Mercedes engine is precisely of the same type used on the twelve-cylinder engine which I shall describe. It has two venturi throats, in the center of which is placed the gasoline spray nozzle of conventional type with fixed orifices, immediately above which are placed two barrel-type throttles with side outlets. An idling or primary nozzle is arranged to discharge above the top of the venturi throat. The carbureter body is of cast aluminum and is water-jacketed. It is bolted directly to an air passage passing through the top and bottom half of the crankcase, which passes down through the oil reservoir. The air before reaching the carbureter proper has to some extent cooled the oil in the crank chamber and has itself been heated to assist in the vaporization. The inlet pipes are copper. All the passages between the venturi throat and the inlet valve have been carefully finished and polished. The only abnormal thing in the design of this engine is the short

(*Continued on page* 485)



Benz piston and connecting rod ensembly

FLYING AS AFFECTED BY THE WIND

By F. W. LANCHESTER

IN the preceding article the question of economic flying in the presence of a wind was discussed on the simple assumption of a constant speed of flight through the air. In the present article the more complex conditions will be dealt with when this limitation is removed, that is to say, when the aeronaut is assumed to

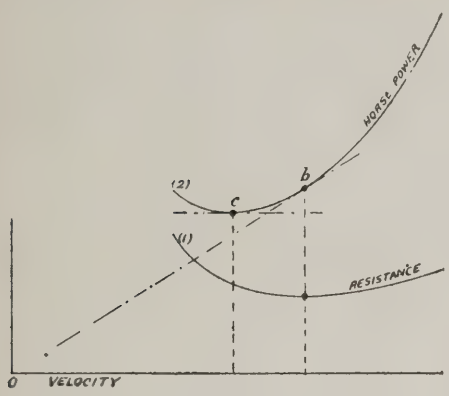


FIG. 5.

vary his flight speed to suit the conditions to obtain the best possible performance.

The resistance curve of a machine is one of the factors which is determined in advance in the design office from established or computed data. In the existing state of knowledge it may be plotted with a fair degree of accuracy; the curve is of the type represented in Fig. 5 (1), in which abscissae represent velocity and ordinates resistance. The curve given is that derived from fundamental theory, and more correctly represent the results which could theoretically be obtained by designing a number of machines of given span and chord, but with the camber modified to suit variations in velocity. As in present-day actual machines the camber is not varied, but instead the attitude of the aerofoil is varied, the economy at conditions other than that for which the aerofoil is designed is necessarily inferior to that given by the graph in Fig. 5 (1). If we assume that the camber of the aerofoil is correctly designed for the condition of least resistance, then the departure of the actual curve will be of the character indicated by the dotted line in Fig. 6a. If for any reason the camber or wing section be designed to obtain the best results for a higher speed, the region in which the actual curve approximates to the theoretical curve will be in a region of higher velocity, as depicted in Fig. 6b. The actual curve is, as already stated, computed with a reasonable degree of accuracy in the design department, consequently for the purpose of this article, it may be assumed as known. For the purpose of this article also the theoretical curve has been assumed in the drawing of the figures as representing a type of curve rather than as any actual example.

Just as in the curves of torque and horsepower of the petrol motor, and in the same relation, we may inplot Fig. 5 (2) a curve of horse power (ordinates) against velocity (abscissae). It is the product for each value of V of the ordinate and abscissa of the resistance curve.

The horse power-velocity curve may be otherwise interpreted. Eliminating *time* as a factor from both, which is equivalent to cancelling the quantity t on both sides of an equation, it may be read as the energy distance curve; as such it was given in Fig. 112 of my "Aerodynamics," here reproduced in Fig. 7. It may be noted that the curve in this case has been plotted upside down, the reason for this being that the problem under consideration was that of the rate of loss of energy as measured by gliding descent, thus the ordinates below the datum represent the descent of an aeroplane in gliding flight—that is to say, *energy*, and the abscissae, as already stated, are *distance* travelled. Referring to Figs. 5 and 7, it will be seen that the point of most economic flight b is that at which a straight line drawn through the origin O is tangent to the curve, and the condition of least horse power is the point c at which the curve is horizontal, namely, where it is tangent to a horizontal line. That this is so becomes abundantly clear when considering the problem as one of gliding, thus in Fig. 7 the point b obviously defines the least gliding angle, and the point c is the point where the distance descended is the minimum.

Now the above applies strictly so long as the problem is not complicated by a wind, that is to say, so long as the distances we are dealing with as abscissae are distances *through* the air and not relatively to the surface of the earth, which is moving relatively to the air. But it is easy to extend the construction to deal with a wind of any desired velocity. Thus let us suppose, as in Fig. 8, that, in the definite period of time or unit time chosen, the wind, or conversely the "earth-drift," be represented by a distance l, then if flying with the wind b must be measured from right to left, O O_1, and when flying against the wind l must be measured from left to right, O O_2. Then the most economic speed of flight is given by drawing a tangent, as the case may be, from the point O_1 or O_2 to the graph, the point of contact, in the former case, will indicate a lower speed

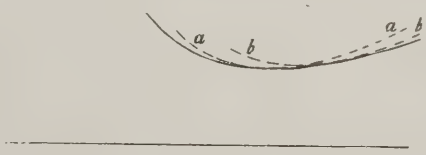


FIG. 6.

of flight Oa_1, and, in the latter case, will indicate a greater speed of flight, Oa_2. Presuming that the graph be correctly plotted for a given machine from the known data, this construction will give the best possible speed of economic flight under the conditions given, V_1 or V_2 in terms of V the speed of least resistance. The extent by which any other flight speed is penalized may be deduced from the increased energy consumed as shown by the tangent of the angle, measured from the displaced origin, being greater than its minimum value.

The effect of varying the flight speed through the air in accordance with the foregoing theory and construction, according to whether traveling with or against the wind, is clearly beneficial, enabling an appreciably better performance to be achieved than indicated by Figs. 1 to 5 of the preceding article. Since

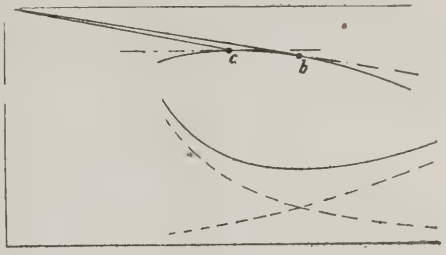
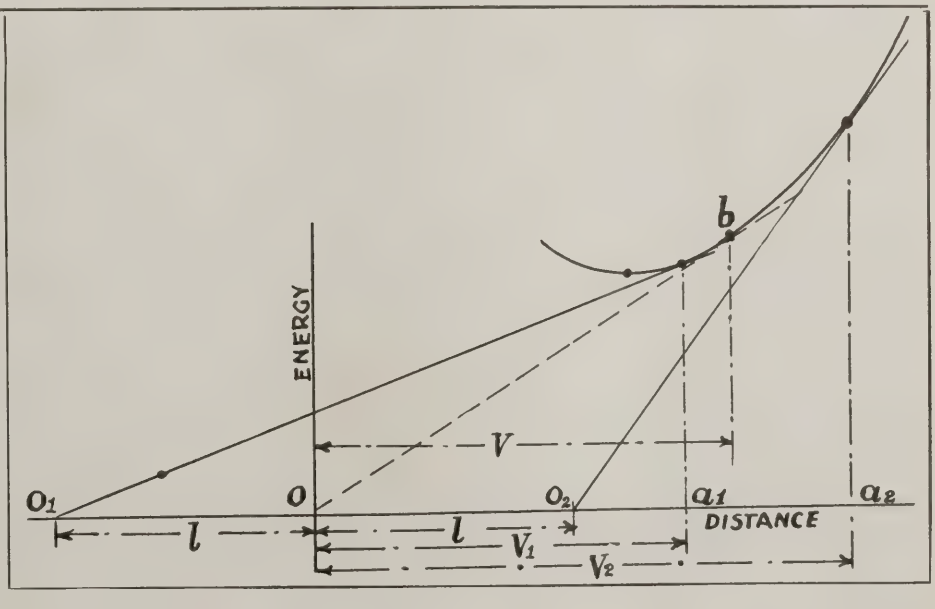


FIG. 7.

the improved economy is obtained when going against the wind by adopting a higher flight velocity, and when going with the wind by adopting a lower flight velocity, it is clear that at some intermediate course the best flight velocity will be normal, and on that intermediate course no improvement will be possible.

It will be understood that the questions of motor and propeller efficiency as affected by the speed of flight have not been introduced into the present discussion. Before the full theory for the actual flying machine is complete the actual propulsion side of the problem has to be taken into account; the economics, so far as the present article is concerned, relate to what may be termed the gliding or tow-rope régime. If the propeller were one of "optimum" diameter, and if the motor were working at or near its speed of maximum efficiency, the economics of gliding flight and actual flight would not be widely different. Under actual conditions, however, considerable allowances would have to be made in interpreting the theoretical results as above given, in view of the fact that the screw propeller being commonly less than "optimum" diameter, tends to higher efficiency at increased speed. It is an important fact that as flight speeds increase the relative restriction of propeller diameter becomes less, in other words, the "optimum" diameter of theory becomes more and more nearly that which experience has shown it possible to employ, and so the difference between *gliding* economics and *flying* economics tends to disappear.



THEORY OF PRESSURE ON A PLANE SURFACE DUE TO A RELATIVE WIND

By A. E. WATSON

(*Concluded from page* 111)

TO find the pressure on the back of element K it should be noted that the plane is moving away from the incident streams. Thus streams which, when the plane is at rest, are incident with normal velocity components less than v, are unable to overtake the plane when it is moving with velocity v. These streams correspond to the zone DMNF. There is thus a corresponding decrease in the number of impacts in unit time, with corresponding decrease in effective density of incident streams, and therefore also of actual density in the immediate vicinity of the back of the element in the ratio $\frac{\text{surface MRN}}{\text{surface DRF}} = \frac{V - v}{V}$.

A limit is reached when $v = V$. At this value the region in the immediate vicinity of the back of the element becomes vacuous, and remains vacuous for all values of v higher than V. It will be seen that the surface MRN has the same significance with respect to the pressure on the back of the element K as the surface MEN has with respect to the pressure on the front of the element. The pressure on the back is therefore obtained from (8) by integrating between limits corresponding to the surface MRN.

It is convenient to work in terms of a. From the triangle GCK we have

$$V^2 = a^2 + v^2 - 2av\sin\phi$$
$$\therefore \sin\phi = \frac{a^2 - (V^2 - v^2)}{2av} \qquad (9)$$

Again, we have

$$a^2 = V^2 + v^2 + 2Vv\sin\theta$$

whence, by differentiating

$$2a.da = 2Vv\cos\theta.d\theta$$
$$\therefore \cos\theta.d\theta = \frac{a.da}{Vv} \qquad (10)$$

Substituting (9) and (10) in (8)

$$\int a^2\sin^2\phi.\cos\theta.d\theta = \int a^2\left\{\frac{a^2 - (V^2 - v^2)}{2av}\right\}^2.\frac{a}{Vv}.da$$
$$= \frac{1}{4Vv^3}\int\left\{a^5 - 2a^3(V^2 - v^2) + a(V^2 - v^2)^2\right\}da.$$
$$= \frac{1}{4Vv^3}\left\{\frac{a^6}{6} - \frac{a^4}{2}(V^2 - v^2) + \frac{a^2}{2}(V^2 - v^2)^2\right\} \qquad (11)$$

This is the general integral to be evaluated between the necessary limits. Two cases must be considered, viz.:—

(1) For values of v up to and including V.

(2) For values of v from V upwards.

Case 1.—When v is less than V, the plane MN cuts the sphere of reference. For the pressure on the front of the element, a varies between the limits EK and NK, or $(V + v)$ and $\sqrt{V^2 - v^2}$.

Thus $\frac{1}{4Vv^3}\left[\frac{a^6}{6} - \frac{a^4}{2}(V^2 - v^2) + \frac{a^2}{2}(V^2 - v^2)^2\right]_{\sqrt{V^2 - v^2}}^{V + v}$

$$= \frac{1}{4Vv^3}\left[\frac{(V + v)^6 - (V^2 - v^2)^3}{6} - \frac{(V + v)^4 - (V^2 - v^2)^2}{2}(V^2 - v^2) + \frac{(V + v)^2 - (V^2 - v^2)}{2}(V^2 - v^2)^2\right]$$

which, by straightforward simplication, becomes

$$\frac{V^2}{3} + Vv + v^2 + \frac{v^3}{3V} \qquad (12)$$

and the pressure is obtained by multiplying this expression by the density of the gas.

If we put $v = nV$, the expression for the pressure on the front of the element becomes

$$p = \rho V^2\left(\frac{1}{3} + n + n^2 + \frac{n^3}{3}\right) \qquad (13)$$

It should be remembered that this expression only holds for values of n up to unity.

The first term is constant and equal to the static pressure, the remaining terms giving the increase of pressure due to the relative wind.

When $n = o$, $p = \frac{\rho V^2}{3}$, the static pressure.

The interesting result is also shown that, when n is small, the third and four therms are negligible in comparison with the second, so that for low values of v the increase of pressure is approximately proportional to the velocity. As v increases the second and third powers become more important.

When $v = V$, so that $n = 1$

$$p = \frac{8}{3}\rho V^2 = \text{eight times the static pressure.}$$

Expression (13) can be written in the easily remembered form

$$p = \frac{\rho V^2}{3}\left(n^3 + 3n^2 + 3n + 1\right) = \frac{\rho V^2}{3}\left(n + 1\right)^3 \qquad (14)$$

For the pressure on the back of the element, the limits of a are RK and NK, or $(V - v)$ and $\sqrt{V^2 - v^2}$.

Thus $\frac{1}{4Vv^3}\left[\frac{a^6}{6} - \frac{a^4}{2}(V^2 - v^2) + \frac{a^2}{2}(V^2 - v^2)^2\right]_{V - v}^{\sqrt{V^2 - v^2}}$

$$= \frac{1}{4Vv^3}\left[\frac{(V^2 - v^2)^3 - (V - v)^6}{6} - \frac{(V^2 - v^2)^2 - (V - v)^4}{2}(V^2 - v^2) + \frac{(V^2 - v^2) - (V - v)^2}{2}(V^2 - v^2)^2\right]$$

which by simplification becomes

$$\frac{V^2}{3} - Vv + v^2 - \frac{v^3}{3V} \qquad (15)$$

Putting $v = nV$ as before, the pressure on the back of the element is given by

$$p = \rho V^2\left(\frac{1}{3} - n + n^2 - \frac{n^3}{3}\right). \qquad (16)$$

Here, again, the first term is the constant static pressure, the remaining terms giving the negative increase (*i.e.*, decrease) in pressure. As before, when $v = o$, $p = \frac{\rho V^2}{3}$. Also, when v is small, the decrease of pressure is proportional to the velocity. When $v = V$, or $n = 1$, $p = o$.

Expression (16) may be written in the form

$$p = \frac{\rho V^2}{3}(1 - n)^3. \qquad (17)$$

The total resistance r due to relative wind is given by the difference between the pressures on the front and back of the element, *i.e.*, by subtracting (17) from (14). Thus

$$r = \rho\frac{V^2}{3}\left[(n + 1)^3 - (1 - n)^3\right] = \rho\frac{V^2}{3}\left[(n + 1)^3 + (n - 1)^3\right]$$
$$= \frac{\rho V^2}{3}(2n^3 + 6n). \qquad (18)$$

Case 2.—When $v > V$, the pressure on the back of the element is always zero, the sphere of reference being entirely out of contact with the plane, values of a for the back vanishing. The pressure on the front of the element (which is equal to the total resistance r in this case) is found by integrating over the whole surface of the sphere between the limits of a, $(v + V)$ and $(v - V)$.

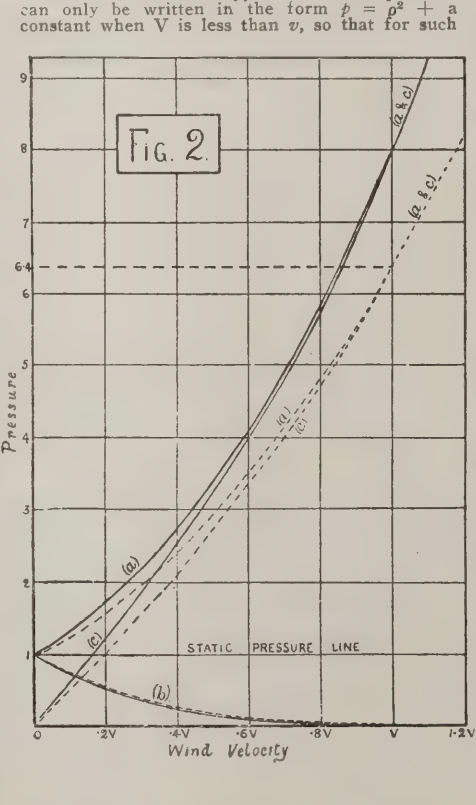
Thus $\frac{1}{4Vv^3}\left[\frac{a^6}{6} - \frac{a^4}{2}(V^2 - v^2) + \frac{a^2}{2}(V^2 - v^2)^2\right]_{v - V}^{v + V}$

$$= \frac{1}{4Vv^3}\left[\frac{(v + V)^6 - (v - V)^6}{6} + \frac{(v + V)^4 - (v - V)^4}{2}(v^2 - V^2) + \frac{(v + V)^2 - (v - V)^2}{2}(v^2 - V^2)^2\right]$$

which reduces to $\frac{2}{3}V^3 + 2v^2$, so that

$$p = \frac{2}{3}\rho V^3 + 2\rho v^2. \qquad (19)$$

Remember that we are now dealing with a state of affairs in which the density of the gas in the immediate vicinity of the plane is 2ρ, as previously explained, we see that the first term in the constant static pressure due to gas of this density, and the second term is the pressure due to a relative wind of velocity v calculated for gas of density 2ρ by the usually given application of the Newtonian method. This result shows clearly that the pressure due to the relative wind is only proportional to the square of the wind velocity v when the term $\frac{2}{3}\rho V^2$ is negligible—that is, when $V = o$, or v is infinite. Considered in another way, we see that the pressure can only be written in the form $p = \rho^2 +$ a constant when V is less than v, so that for such an expression to hold good for values of v down to zero, the constant must be zero. Bearing in mind also the fact that (19) is established under conditions in which the pressure on the back of the element is zero, the reader will now be in a position to grasp more fully the significance of the comments with which we started.



It is interesting to note that, putting $v = nV$ as before, (19) can be written in the form

$$p \text{ (or } r) = \frac{\rho V^2}{3}\left[(n + 1)^3 - (n - 1)^3\right] \qquad (20)$$

which should be compared with (18).

It will be noted that the value $v = V$ is a critical velocity in that, at this value, there is discontinuity in the law of pressure variation for the front and back of the plane, and for the total resistance. This discontinuity occurs, according to accepted views, at a velocity equal to 1·34 times the velocity of sound. There is, however, no geometrical discontinuity in the pressure-velocity curves.

With the alternative view suggested by the writer, a similar discontinuity is found, but at a velocity $v = V$ identical with the velocity of sound. To obtain expressions corresponding to those found above, we use $\int a^2\sin\phi.\cos\theta.d\theta$ in place of $\int a^2\sin^2\phi.\cos\theta.d\theta$, the method of procedure being the same in each case as before. Thus

$$\int a^2\sin\phi.\cos\theta.d\theta = \int a^2\left\{\frac{a^2 - (V^2 - v^2)}{2av}\right\}\frac{a.da}{Vv}$$
$$\frac{1}{2Vv^2}\int\left\{a^4 - a^2(V^2 - v^2)\right\}da = \frac{1}{2Vv^2}\left[\frac{a^5}{5} - \frac{a^3}{3}(V^2 - v^2)\right]$$

the general integral to be evaluated between the proper limits. We will here give only the results.

Case 1, $v < V$.—Pressure on the front of the element is given by

$$p = \rho V^2\left(\frac{1}{2} + \frac{4}{3}n + \frac{9}{8}n^2 + \frac{4}{15}n^3 - \frac{1}{48}n^4 + \text{terms involving higher powers of } n\right). \qquad (21)$$

When $n = o$, $p = \frac{\rho V^2}{2}$.

For low values of v, the increase of pressure is proportional to the wind velocity, approximately.

When $v = V$, $n = 1$, and the pressure is given by

$$p = \frac{16}{5}\rho V^2 = 6\frac{2}{5}\text{times the static pressure,}$$

a value to which (21) approximates as n increases.

For the back of the element

$$p = \rho V^2\left(\frac{1}{2} - \frac{4}{3}n + \frac{9}{8}n^2 - \frac{4}{15}n^3, \text{ \&c.}\right) \qquad (22)$$

When $n = o$, $p = \frac{\rho V^2}{2}$, and when $n = 1$, $p = o$, a value to which (22) approximates as n increases.

The total resistance is given by

$$r = \rho V^2\left(\frac{8n}{3} + \frac{8n^2}{15}\right). \qquad (23)$$

Case 2, $v > V$.—The pressure on the back of the element is zero, as before. The pressure on the front, which is equal also to the total resistance, is given by

$$p = 2\rho V^2\left(n^2 + \frac{2}{3} - \frac{1}{15n^2}\right) \qquad (24)$$

When in the form $p = 2\rho\left(v^2 + \frac{2}{3}V^2 - \frac{V^4}{15v^2}\right)$, we see that $p = 2\rho v^2$ when $V = o$, and can only be proportional to v^2 for all values of v when the second and third terms are negligible, *i.e.*, when $V = o$, or $v = \infty$.

It is interesting to note that, with both views of kinetic theory, the expressions for the pressures on the back and front of the element involve the first, second and third powers of v or n up to the value $n = 1$, whilst the total resistance involves the first and third powers only. For values of n greater than unity the expression giving both pressure and resistance omits the odd powers depending only on the second power in (19), and depending chiefly on the second power in (24).

The above results are shown in the graph (Fig. 2), which gives the pressure-velocity curves—(*a*) for the front of the element; (*b*) for the back of the element; (*c*) for the total resistance—the full-line curves corresponding with expressions (14), (17), (18) and (19), and the broken-line curves with (21), (22), (23) and (24).

As a further development of more particular interest to aeronautics, we may apply the foregoing methods to determine how, for a given wind velocity v, the pressures on the front and back of an element of aera vary when the inclination of the relative wind varies. It will be seen from Fig. 3 (in which the lettering is similar to that of Fig. 1 to facilitate comparison) that the effect of compounding the relative velocity v of the wind with the molecular velocity V is to displace the centre C of the sphere of reference a distance CK ($= v$) from the element K along a line inclined to the plane at angle EKN ($= \psi$, say), equal to the inclination of the relative wind. Thus, for any stream such as GC ($= V$) the resultant velocity is given by GK ($= a$).

If from G we draw a perpendicular GS to the plane, meeting the plane at S, and join SK, the angle GKS ($= \beta$, say) is the resultant inclination of the stream to the plane. By reasoning

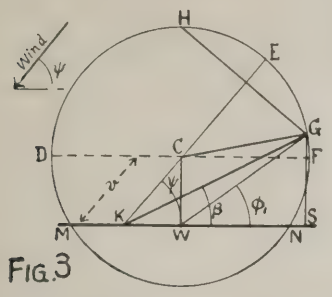


FIG. 3

similar to that already given, we see that we must find the mean value of $a^2\sin^2\beta$ for all points such as G uniformly distributed over the surface MHEN, and apply this mean value to gas of effective density corresponding to the same surface. We cannot, however, take a zone GH as our element of surface, because β has not the same value for all points in this zone. Now, $a^2\sin^2\beta = GS^2$, and if we draw CW perpendicular to the plane MN, join GW, SW, we see that, putting a_1 for GW, and ϕ_1 for the angle GWS, $a_1^2\sin^2\phi_1 = GS^2 = a^2\sin^2\beta$. We therefore have to find the mean value of $a_1^2\sin^2\phi_1$ for all points such as G uniformly distributed over the surface MHEN. This is the problem already solved with reference to Fig. 1, except that CW ($= v \sin\psi$) has taken the place of CK (Fig. 1). We need therefore only substitute $v \sin\psi$ for v in the expressions previously obtained, or, alternately, put $n \sin\psi$ for n, to obtain corresponding expressions for relative wind making an angle ψ with the plane.

Thus, for values of n up to $\frac{1}{\sin\psi}$, we get from (14) the pressure on the front of the element is given by

$$p = \frac{\rho V^2}{3}\left(n\sin\psi + 1\right)^3 = \frac{\rho V^2}{3}\left(n^3\sin^3\psi + 3n^2\sin^2\psi + 3n\sin\psi + 1\right).$$

This result shows that we cannot, for a given velocity, express the relation between inclination and pressure as a constant pressure multiplied by a function of $\sin\psi$. In other words, the way in which pressure varies with inclination depends upon the value of v (or n). When $\psi = \frac{\pi}{2}$, the above expression becomes identical with (14). When $\psi = o$, the wind is parallel to the plane, and $p = \frac{\rho V^2}{3}$.

Again, when n is small, the excess pressure due to the wind varies approximately as $\sin\psi$. The critical velocity is now $v\sin\psi = V$, or $n\sin\psi = 1$. With this value of $n\sin\psi$, we get $p = \frac{8}{3}\rho V^2$, the value obtained for the normal wind. Thus the pressure corresponding to the critical velocity is the same for all conditions.

For the back of the element we get from (17)

$$p = \frac{\rho V^2}{3}\left(1 - n\sin\psi\right)^3.$$

Thus $p = \frac{\rho V^2}{3}$ when either n or ψ is zero, and the above expression becomes identical with (17) when $\psi = \frac{\pi}{2}$. When $n\sin\psi = 1$, $p = o$.

Similarly, for the total resistance, we get from (18)

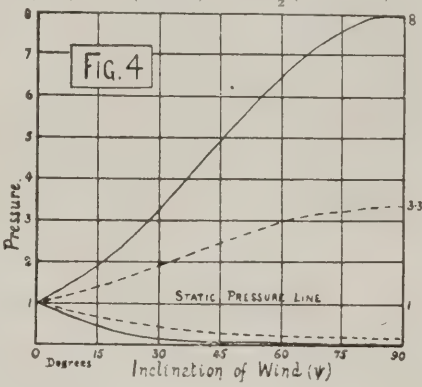
$$r = \frac{2}{3}\rho V^2\left(n^3\sin^3\psi + 3n\sin\psi\right).$$

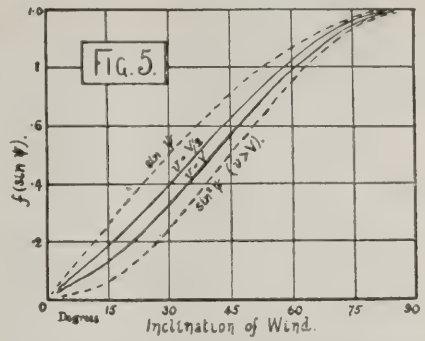
When n is greater than $\frac{1}{\sin\psi}$ we get, from (19),

$$p = r = 2\rho\left(\frac{V^2}{3} + v^2\sin^2\psi\right),$$

which becomes $p = 2\rho v^2\sin^2\psi$, in agreement with the usual application of the Newtonian method, when $V = o$, as we should expect.

Curves are given in Fig. 4 showing how the pressure varies with the inclination for two different velocities of relative wind, viz., $v = V$ (full lines) and $v = \frac{V}{2}$ (broken lines). To





show more clearly how the relation between pressure and inclination depends upon the velocity, the excess pressure on the front of the element expressed, for different inclinations, as a fraction of the excess pressure when the wind is normal, has been plotted in Fig. 5. The full line curves relate to the velocities $v = V$ and $v = \frac{V}{2}$. The broken line curves given for the sake of comparison relate to velocities $v =$ approximately zero, and $v > V$, the curves showing respectively $\sin\psi$ and $\sin^2\psi$.

In the foregoing we have confined our attention to an element of area. If the relative winds were the same for all elements of a surface, the above results would apply to a finite area, the pressure being the same at all points of the surface. With a plane of finite area, however, the wind is deflected so that the relative wind is not the same and the pressure distribution is not uniform over the surface. For this reason, amongst others, the above results could not be expected to agree exactly with experiment. With a plane of, for example, circular or square form, moving in a direction normal to the surface, the relative wind should, from considerations of symmetry, be normal at or near the geometric centre of the figure. If the foregoing theory is sound, we might reasonably expect it to agree fairly approximately with pressure variation, as velocity varies, measured in the region of the geometric centre. In any case, it appears to be clear that the velocity-square law and the sine-square law cannot be accurate for a gas capable of exerting static pressure. Further, it seems highly probable that these laws cannot be accurate for liquids, even if perfectly mobile, although the foregoing theory, without modification, is not applicable to liquids.

Military Aeronautics

(*Continued from page* 469)

By the direction of the President, First Lieut. Richard G. Johnson, S. O. R. C., is honorably discharged from the service of the United States, to take effect this date, his services being no longer required.

First Lieuts. Henry L. Davis and Morris S. Winsck, Medical Reserve Corps, are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Ind., and are assigned to the Aviation Section, Signal Corps, proceeding to Bellville, Illinois, reporting in person to the commanding officer, Signal Corps Aviation School, Scott Feld, for duty, and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

Major George E. A. Reinberg, Signal Corps, will proceed to Millington, Tenn., report in person to the commanding officer, Park Field, for assignment to duty.

Capt. Samuel T. Fisk, Signal Reserve Corps, is relieved from duty in the office of the department signal officer, Western Department, and will proceed to Camp Sherman, Chillicothe, Ohio, reporting to the commanding general, for asignment to duty with the 319th Field Signal Battalion.

The following named First Lieuts. Aviation Section, Signal Corps, Reserves are announced as on duty requiring them to participate regularly and frequently in aerial flights from dates after their respective names: Winthrop H. Battles, Oct. 11, 1917; Charles S. Chase, Jr., October 15th, 1917; Benjamin S. Robertson, Jr., September 7, 1917.

Special Order 261

39. The following named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Camp Greenleaf, Fort Oglethorpe, Ga., and will proceed to San Antonio, Tex., and report in person to the commanding officer, Signal Corps Aviation School, Camp Kelly, that place, for duty with the Aviation Section, Signal Corps, and by letter to the Chief Signal Officer, Washington, D. C.: Capt. Raymond F. Longacre, Capt. Joseph C. Monmonier, First Lieut. Moody W. Arnold, First Lieut. Floyd Clardy, First Lieut. Beeckman J. Delatour, First Lieut. Frank A. Farmer, First Lieut. Thomas C. Galloway, First Lieut. Henry H. Haft, First Lieut. James E. James, First Lieut. Otto E. Johnson, First Lieut. Frederick E. Keller, First Lieut. Leonard G. Larner, First Lieut. Samuel E. Lyon, First Lieut. John E. McDill, First Lieut. William F. MacKnight, First Lieut. Malcolm Y. Marshall, First Lieut. Francis J. O'Brien, First Lieut. Guy McC. Reeser, First Lieut. John D. Robinson, First Lieut. Lieuen M. Rogers, First Lieut. Solomon F. Rudolf, First Lieut. Roscoe C. Stewart, First Lieut. William R. Strange, First Lieut. John E. Struthers, First Lieut. Grayson E. Tarkington, First Lieut. William S. Tillett, First Lieut. Clarence LeF. Vreeland, First Lieut. Adam C. Walkup.

Special Orders 260

Paragraph 164, Special Orders, No. 251, War Department, October 27th, relating to First Lieut. Alfred P. Bourquardez, Jr., Aviation Section, S. R. C., is revoked.

Paragraph 170, Special Orders, No. 218, War Department, September 19, 1917, relating to First Lieut. Sigismond G. Boernstein, S. R. C., is revoked.

Second Lieut. John E. Hornbaker, Aviation Section, S. R. C., is ordered to active duty and will proceed to Garden City, Long Island, N. Y., reporting in person to the commanding officer of the aviation concentration camp, for assignment to duty.

Capt. Paul B. Holmes, S. R. C., is assigned to active duty and will proceed to the office of Chief Signal Officer of the Army for assignment to duty.

Second Lieut. Oliver R. Johnson, Aviation Section, S. R. C., is ordered to active duty and will proceed to Garden City, Long Island, N. Y., reporting to the commanding officer in person, aviation concentration camp, for assignment to duty.

Major Hugh J. B. McElgin, Aviation Section, Signal Corps, is announced as a junior military aeronaut with rank from July 24, 1917, under the provisions of section 6 of an act of Congress approved July 24, 1917.

Capt. Leland W. Howe, United States Army, retired is relieved from duty at headquarters, Eastern Department, and will proceed to his home and upon arrival there to report by telegraph to the Adjutant General of the Army. Lieut. Col. Howe is relieved from active duty to take effect upon his arrival at his home.

First Lieut. Frank A. McGann, S. R. C., is relieved from his present duties and will proceed to Camp Jackson, Columbia, South Carolina, and report to the commanding officer, 402nd, Field Battalion for duty.

First Lieut. Karl S. Axtater, Aviation Section, S. R. C., is assigned to active duty reporting in person to the commanding officer, Army Balloon School, Fort Omaha, Nebraska, for duty.

Second Lieut. Richard D. Walker, Aviation Section, S. R. C., is assigned to active duty and will proceed to Garden City, Long Island, N. Y., reporting to the commanding officer, aviation concentration camp, for duty.

First Lieut. Roy C. Ludick, Aviation Section, S. R. C., is assigned to active duty and will proceed to Dayton, Ohio, reporting to the commanding officer, McCook Field, for duty.

Temporary First Lieuts. Fred F. Nolde and William Johnson, Signal Corps, will proceed to this city and report to the Chief Signal Officer of the Army for duty.

Capt. Alexander Macomber, Engineer Reserve Corps, in addition to his other duties, is assigned to the command of the provisional Anti-aircraft Searchlight Detachment and will report in person without delay to the commanding officer, Washington Barracks, for assignment to duty.

The following named officers are announced as on duty requiring them to participate regularly and frequently in aerial flights from the dates set after their respective names: Major Cushman Hartwell, Signal Corps, Oct. 16, 1917; Capt. Karl K. Gorman, 6th Cavalry, October 11, 1917; Capt. John N. Thorp, 5th New Jersey Infantry, Oct. 10, 1917.

First Lieut. Howard W. Treat, Aviation Section, S. R. C., is assigned to active duty and will report to the Chief Signal Officer of the Army for duty.

THE AERODYNAMICS OF FORMATION FLYING

By J. R. PANNELL*

THE question of formation flying was brought forcibly to the notice of the people of London by the German aeroplane raid of July 7th. The subject has been very fully treated by Mr. F. W. Lanchester in three articles, which were published in the British publication "Flying" and he makes quite a strong case for

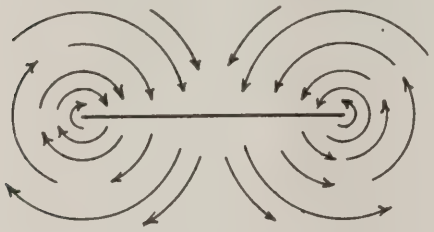


Figure 1

formation flying as a military manoeuvre.

In one of the articles six advantages of flying in formation are enumerated, but the one with which the present writer is mainly concerned is the first, which states that "flying in formation lends itself to an economy of horse-power and economy of petrol." An actual flying experience may shed some light on this question in the near future, but it does not appear to the writer that Mr. Lanchester's arguments would establish a very convincing case.

It is a matter of common observation that certain birds do fly in formation, and it may be that some economy of effort is effected by the "following" birds over that exerted by the leader of the formation. In this connection photographs of birds flying in formation would enable the spacing to be studied more accurately than would be possible by visual observation, and it would then be seen if the relative lateral positions of the birds supported the view that favourable eddies were being taken advantage of.

In another article the eddy formation round the wing tips is discussed in detail. The type of eddy to which Mr. Lanchester refers is shown in Fig. 1, and was fully discussed in his books, "Aerodynamics" and "The Aerofoil." Flow of this type has also actually been observed round the tip of a model aerofoil under test in a wind channel at the National Physical Laboratory. This eddy was found to

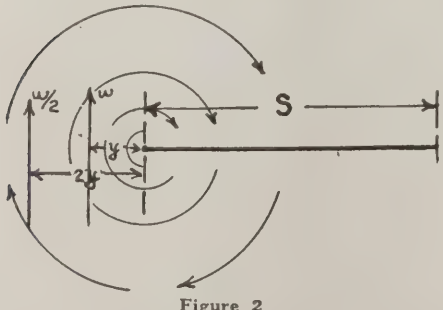


Figure 2

exist with undiminished strength at a distance equal to one-third of the chord behind the trailing edge of the aerofoil, but no measurements were made further back than this. The rate at which this eddy motion will decay is an important point in considering the assistance which may be derived from it by a "following" aeroplane, especially as in the present state of proficiency in formation flying the distance between an aeroplane and the one next behind it is necessarily considerable. The next point which presents itself for consideration is, What is the proper relative height for the different machines? In order that an aeroplane may be supported in the air, the eddies from the wings must have a downward trend, and it seems probable that if aeroplanes followed each other in V formation in a horizontal plane the vortices from the leading machine would pass under the following machine. Though a bird might be able to "feel" when it was flying in "good" air it would be a difficult matter for a pilot to do so, except that if he were flying too high or too low he would be flying in air which had a horizontal component parallel to the leading edge of the wing. If the rotational flow had any appreciable strength the pilot might discover that he was at the wrong height by his machine being carried towards the neighboring one. Let us for the present assume that the machine is flown at the proper relative height and full advantage is being taken of the up-current, and examine the manner in which the strength of the vertical component of the

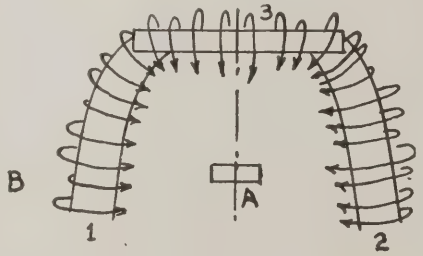


Figure 3

rotational flow will vary as we move outwards from the vortex core. Referring to Fig. 2, it can be shown, from the equations of motion for rotational flow due to a vortex, that the linear velocity at points along the radial line will vary inversely as the distance from the centre of the vortex. If we now consider a number of aeroplanes flying *en échelon* it is evident that for all machines flying in ascending air the strength of the up-current will vary from a maximum near the tip of the inner wing to a minimum at the extremity of the outer wing. This variation in the strength of the up-current would possibly cause rotation of the machine about its longitudinal axis to an undesirable extent if the up-current was strong enough to have an appreciable effect on the power required to sustain the aeroplane.

Measurements which have been made on the angle which the "wash" from an aerofoil makes with the horizontal afford some evidence as to the order of magnitude of the vertical currents which are likely to exist behind an aerofoil. On Mr. Lanchester's theory the conditions will approximate to those shown in Fig. 3, and it is at once evident that the downward flow at the tail of the machine will be the result of the three rotational motions, 1, 2, and 3 (position A). If we now consider a point in the upward flow at a distance equal to half the span from the core of the eddy No. 1 (position B) we find that we have a vertical component, which, as compared with the vertical component at position B, is the result of an equal effect from No. 1, a slight effect of opposite sense from No. 2 and no effect from No. 3. In short, the vertical component of the velocity at B will be less than half that at A. Experiments in the wind channels at the National Physical Laboratory show that the angle of downwash in the position which would be occupied by the tail of an aeroplane is approximately 0.5 of the angle of incidence of the planes reckoned from the angle at which the lift is zero. Thus for an aeroplane flying with its wings at an angle of incidence of 2 degrees the angle of downwash will be 2 degrees if the angle of no life is—2 degrees, and if this downward trend of the air is due entirely to rotational flow the upward trend, which would be useful to an aeroplane following in V formation, will be about half this amount at the centre of that aeroplane.

It may be noted that the measurements referred to were made behind a model bi-

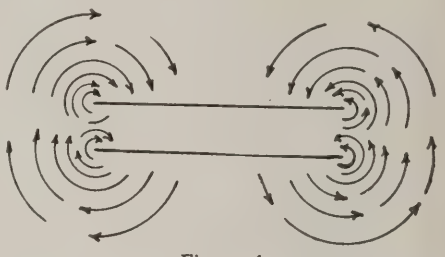


Figure 4

plane, and, so far as the writer is aware, none have been made behind a monoplane. The eddies from the wing tips of a biplane will tend to form in the manner shown in Fig 4, and it will be seen that the flow between the planes and near the wing tips is outward near the upper plane and inward near the lower. There will consequently be a loss of strength of the vortices due to their mutual action on each other, and it seems probable that the eddies will become dissipated in the region behind the planes from this cause. The result of this retarding effect would presumably be that the vertical components of the stream behind a monoplane would be relatively stronger than those behind a biplane.

Referring further to one of Mr. Lanchester's articles, in one of the figures three birds are shown flying line abreast, and it is stated that "the agglomeration may be regarded as a single bird of very high aspect ratio."

It appears to the writer that this statement is only justified in the plan form if the wings in question are approximately rectangular. The loss of efficiency near the extremity of the wing is due to the flow of air from the high pressure region below the wing to the low pressure region above it. For the line abreast flying with wings of a plan form such as that shown in Fig. 5 it appears that flow of this type must exist, though possibly to a less extent than in the case of a single bird. Further, Mr. Lanchester applies this argument to the case of five aeroplanes flying in V formation, and says that "the échelon formation in Fig. 9a is equivalent, or at least comparable, in respect of the system of sustentation to a single system of high aspect ratio." It is difficult to see in what manner this grouping of aeroplanes can be regarded as equivalent to an aeroplane of five times the span, as the usual type of flow will take place round each wing tip with consequent loss of efficiency.

On the whole it appears very doubtful if any saving can be effected by formation flying, but the matter could possibly be tested by a flight of three machines grouped in the manner shown in Fig. 5. In this way the "following" machine could take advantage of a stronger up-current than would be possible

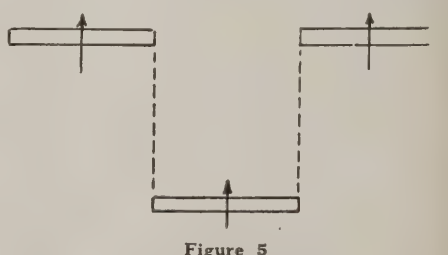


Figure 5

in V formation, and there would be an additional advantage in that the rising current would be symmetrical about the centre of the rearmost machine. If a saving of the order of 10 per cent. (as suggested by Mr. Lanchester) is to be effected by flying *en échelon* it would be higher and readily observed on the petrol consumption in the formation now suggested.

* Courtesy Flying (England).



MILITARY AEROSTATICS



ZEPPELIN L-49 CAPTURED IN FRANCE

THE accompanying illustrations are excellent proof that the French farmer who prevented the crew of the L-49 from destroying their vessel should be awarded the war cross.

According to a staff correspondent of *The Evening Ledger,* the L-49 is 600 ft. long, with a diameter of 90 ft. The hull frame is made of aluminum alloy and is formed of longitudinal and transverse girders, covered with stout netting over which the outer cover of linen is fitted The hull is painted black except on top where it is silvered. A great degree of invisibility is thus secured in night raids. The shape is that of an exaggerated fat cigar.

The L-49 has five motors of 250 h.p. each and four cars, the middle ones of which contain two of the engines and all the control organs and instruments. The airship can develop a speed of fifty or fifty-five miles an hour.

E. Percy Noel, a staff correspondent of the New York *Globe,* who is, besides, an able aeronautical writer, has made a complete survey of the L-49. He describes his impression as follows:

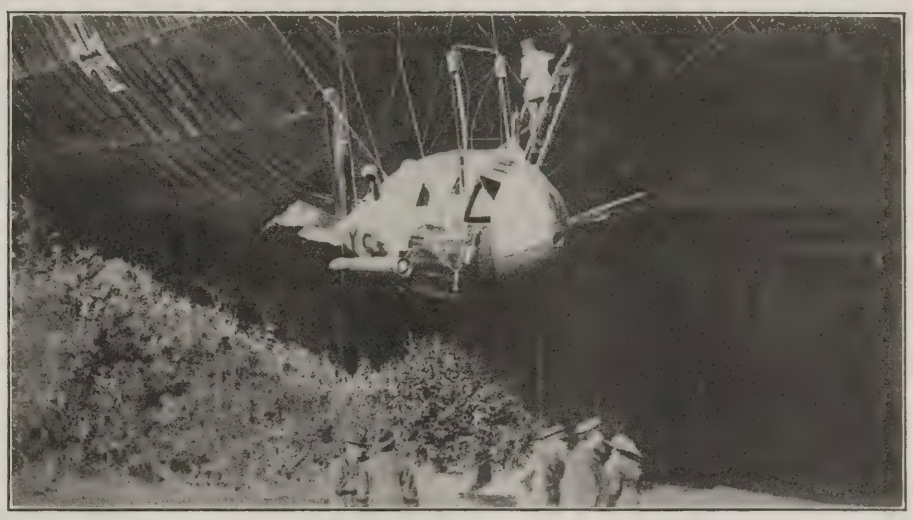
"The German commander, who tried to destroy the Zeppelin L-49 after it had landed on French soil, used a signaling revolver which was equally useful in igniting gas. I examined the hole made by the bullet. It hit at a certain distance from the gas bag for which the flame was meant and failed to ignite the Zeppelin. Without this circumstance, plus the presence of a retired French soldier, who prevented another shot from being fired, the prize would have been promptly reduced to a mass of twisted aluminum and damaged engines.

"This recent great loss to the Germans does not mean the end of the Zeppelins. It is only another and a very important proof of their fallibility, which will perhaps deter the Germans from using them for some months to come. It does not, however, detract anything from their usefulness in overseas work with a fleet. How admirably the craft was devised and equipped for this work I realized after a close inspection, although at the same time I was surprised at the makeshift appearance of the construction and workmanship. Any French or English constructor would be ashamed of it.

"One notable exception was the wireless room and the installation which resembled closely that of a transatlantic liner of the latest type. The apparatus itself embodies no new principles, but according to a French expert who was sent to examine it, included several features of importance. Despite the hammer blow delivered by the operator before abandoning it, the expert assured me that it would be possible to reconstruct the apparatus completely.

"Forward of the wireless room was a commodious bridge or control station furnished with a fiber mat to assist in keeping the occupants warm. A three-ply glass windshield also serves the same purpose. At the right was a wheel directing the elevators. In the center and forward was another. Both were like those used on a small motor yacht for operating the rudder. On the right were a chart table and the gas bag control. Square stools with rounded corners, made of three-ply thin wood, were used here as well as elsewhere. They were so light that when a French officer stood on one to climb into the hull it collapsed.

"Aft of the wireless was the engine room, where the largest of five engines actuated a direct-drive propeller. It was reached by a ladder leading to a narrow gangway extending 500 or 600 ft. inside the hull. There was a folded parachute on the engine room floor, giving the impression that the engineer wore it attached to his shoulders until the moment when the commander decided to surrender because he was too hotly pressed by the French aviators in the 6,000 or 7,000 m. level (18,000 to 21,000 ft.).



The power car of the L-49, as rigged to the hull. The car houses a Maybach engine



The Zeppelin as it appeared immediately after its capture



The rear end of the Zeppelin L-49, showing the controlling rudders

FOREIGN NEWS

BELGIUM

November 13.—An Admiralty communication says:

"In the afternoon of November 12 British naval aircraft carried out a bombing raid on the Vlisseghem (Belgium) airdrome. Several bombs were dropped on the objectives. The visibility was only fair, owing to the haze.

"Several engagements with enemy aircraft have taken place. In one, a hostile scout was shot down in flames. All our machines returned safely."

The Belgian communication issued by the French War Office on Nov. 14, says that enemy aviators carried out a raid on the night of November 13-14 and dropped a number of bombs on Adinkerke, Banne and Furnes, causing a number of victims among the civilian population.

FRANCE

France is sending her youngest aviation "ace" to the United States to assist in training the American flyers. He is Sergt. Soldier who, although under twenty, has destroyed seven German planes. An ace is an airman who brings down five or more enemy machines.

On Tuesday, Nov. 13, four German aeroplanes were brought down by French pilots and four others fell disabled within the enemy lines. French aviators made a number of effectual raids, dropping many projectiles on various enemy depots and cantonments in the region of Mulhausen. German aviators carried out a violent bombardment on Tuesday night in the region of Calais. It is reported there were a number of victims among the civilian population.

An impressive service was held Nov. 14 at the headquarters of the Lafayette Escadrille in honor of Capt. George Guynemer, the famous French airman who was recently killed in combat. In a hollow square on the field near the airdrome from which members of the Lafayette Flying Squadron daily venture forth to give battle to the German airmen, the four fighting squadrons quartered there drew up and listened to an address by the commandant of all the French air forces.

After the service there was a distribution of the honors recently won by French and American pilots. The Americans decorated were: Lieut. Raoul Lufbery, seventh on the list of French aces, and Sergts. Robert Rockwell, Robert Soulbain and David McKay Peterson. Their citations were as follows:

Lufbery—"A remarkable pilot, who October 24 in the course of three successive patrols and seven close combats brought down his fourteenth adversary and forced five others to fall out of control."

Rockwell—"A fighting pilot, bold and skillful, who has had many battles and met an enemy formation in superior numbers September 24, and forced one opponent to land out of control in his own lines."

Soubiran—"An American engaged in the French air service since the beginning of the war; members of the Foreign Legion; took part in the battle of the Aisne in 1914 and Champagne attack in 1915, wounded October 19, 1915; entered aviation service and proved a remarkable pilot; forced an enemy to fall in October while protecting avions which were attacking an enemy observation balloon."

Peterson—"An excellent fighting pilot; brought down an enemy September 19, following the falling German to within 500 yards of the ground regardless of a heavy fire from an enemy battery; machine-gunned enemy trenches and reserve troops from very low altitudes October 24."

Charles H. Dolan of Dorchester, Mass., has been promoted to the rank of Sergeant.

Lieut. William Thaw and Sergt. Peterson had a fight with three albatross monoplanes on the afternoon of Nov. 14. Sergt. Kenneth Marr of San Francisco, attacked from above by another albatross, was compelled to dive from an altitude of 10,500 feet to 4,500 feet.

William Parringfield of San Francisco, a member of the French Foreign Legion, was killed in action recently, according to a letter received by Jack Barry of Brooklyn from Oscar Mouvet, a comrade, at the front. Parringfield already had been decorated with the War Cross, and in his last fight as his Captain stooped to pin on his breast the military medal the dying soldier murmured: "Tell the folks back home I went out gamely."

GERMANY

Berlin, Nov. 12 (via London).—In the month of October the entente powers lost 244 aeroplanes and nine balloons, according to the official statement issued to-day by the German War Office. The German losses in battle were fifty-seven aeroplanes and one balloon in this period. The text of the statement reads:

In October the enemy aerial losses on the German fronts were nine captive balloons and 244 aeroplanes, including 149 which were brought down behind our lines. The remainder fell beyond the enemy positions. We lost in battle fifty-seven aeroplanes and one balloon.

According to a report coming from Copenhagen, Denmark, Nov. 15, Captain Baron von Richthofen, Germany's leading aviator, expresses himself as unconcerned over the reported preparations to place 20,000 American aviators on the western front. He thinks it will be impossible to get together that many trained pilots, as the training is long and costly and involves heavy casualties. The newcomers, he says, will, particularly at first, "be unable to judge the military conditions, and at least 25 per cent of the machines will be disabled during the long transport."

Lieut. Gen. von Ardenne of the Berliner Tageblatt, who reports this conversation with von Richthofen at the Flanders front, adds that the German air service, which evidently has been forewarned by newspaper discussion of American plans, is steadily increasing the number of aviators and machines.

German fighting aeroplanes, General von Ardenne says, now carry wireless receiving outfits, which enable them to engage in combat promptly with enemy fliers. This is necessitated by new conditions on the Flanders front, where whole squadrons of allied machines can appear over the German lines in a surprisingly short time. German squadrons starting from the ground to meet the invaders would be too late, so they must constantly be in the front lines, either flying or ready for fight.

German aviators say that they have noted recently that a majority of the British fliers in Flanders are showing themselves in the Dixmude section of the front instead of the region of Passchendaele.

GREAT BRITAIN

London, Nov. 15.—Lord Northcliffe has declined a proffer of the administration of the new Air Ministry made to him by Premier Lloyd George.

In a long letter to the Premier, Lord Northcliffe explains that his refusal of the portfolio is due to dissatisfaction with some of the methods of Mr. Lloyd George's administration, especially with regard to relations with the United States, and says that Lord Northcliffe's desire therefore is to maintain an independent attitude.

The Admiralty has issued the following statement regarding the electrically controlled sea raiders which the Germans have been operating off Belgium and several of which have been destroyed:

"The electrically controlled motor boats used on the Belgian coast are twin petrol engine vessels, partially closed in and travel at a high rate of speed. They carry a drum with between thirty and fifty miles of insulated single core cable, through which the boat is controlled electrically. The forepart carries a considerable charge of high explosives, probably from 300 to 500 pounds in weight.

"The method of operating is to start the engine, after which the crew leaves the boat. A seaplane, protected by a strong fighting patrol, then accompanies the vessel at a distance of from three to five miles and signals to the shore operator of the helm. These signals need only be 'starboard,' 'port' or 'steady.' The boat is zigzagged while being steered into a ship and the charge exploded automatically.

"The device is a very old one. A boat similarly controlled was used in H. M. S. *Vernon*, a torpedo experimental ship, as far back as 1885."

ITALY

Rome, Nov. 15.—Signor Caproni, one of the inventors of the noted Caproni aeroplane, now being tried out successfully in the United States, predicts that in the air raids by the enemy will be made next spring on an unprecedented scale. They will not be limited to England but will be extended to France and Italy.

"Germany intends to resort to ruthless aerial warfare on the same lines that she planned her submarine campaign, and extensive damage and loss of life will be inevitable,' he said to-day. "The only effective defence is an offensive, which will be the best strategy, even if the fear of an approaching attack were not justified, since reprisals in any case would be inevitable.

"The Allies should not hesitate to carry out aerial bombardments of Austro-German aeroplane factories and aviation camps, even when they are located in inhabited areas, for it would be a mistake to spare the lives of enemy non-combatants now at the price of the slaughter of our own innocent victims in the future. Such bombardments by the Allies would be justified as a measure of self-defence."

The noted inventor and aviation expert is not pessimistic, but he is impressed by the gravity of the situation and urges that the Allies should concentrate their efforts with the least possible delay to prevent the enemy from acquiring superiority in the air.

"After the war," he said, "I intend to build a machine to carry fifty persons and to be capable of crossing the Atlantic. I even may attempt this some time in 1918. The machine will be a five seater and will make the flight from Newfoundland, touching at the Azores and landing at Lisbon."



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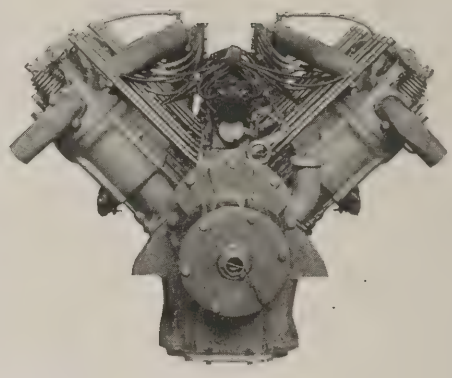
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(*Continued from page* 474)

connecting-rod, which is considerably less than twice the stroke and would be considered bad practice in automobile engines. A short conecting-rod, however, possesses two very real virtues: it decreases the height of the engine, and the piston passes over the bottom dead-center much more slowly than is the case with a long rod.

Other features of the design are a very stiff crankcase, both halves of which are bolted together by long through bolts, the crankshaft bearings are seated in the lower half of the crankcase instead of in the usual caps, and no provision is made for adjustment. The Mercedes Company uses a plunger type of oil-pump having mechanically operated piston valves and driven by worm gearing.

The overhead camshaft construction is extremely light. The camshaft is mounted in a nearly cylindrical cast-bronze case and is driven by bevel gears from the crankshaft. The vertical bevel-gear shaft through which the drive is taken from the crankshaft to the camshaft operates at one and one-half times crankshaft speed. The reduction to the half-time camshaft is secured through a pair of bevel gears. On this vertical shaft the water-pump and a bevel gear for driving two magnetos are mounted. The water-pump mounted on this shaft tends to steady the drive and avoid vibration in the gearing.

The sizes of six-cylinder aviation engines built by Mercedes are as follows:

No.	Bore.	Stroke.	Horsepower.
1	105	140	100
2	120	140	135
3	140	150	150
4	140	160	160

The largest of these, No. 4, has recently had its horsepower increased to 176 at 1450 r.p.m. This general design of engine has been the foundation for a great many other designs, some of which have proven successful but none of which, in the author's estimation, is equal to the original.

Among those that follow more or less closely the scheme of design and arrangement are the Hall-Scott, the Wisconsin, the Renault, the Packard, the Christofferson and the Rolls-Royce. Each of these shows considerable variation in detail. The Rolls-Royce and Renault are the only ones in which the steel cylinder with the steel jacket has been used. The Wisconsin engine has an aluminum cylinder with a hardened steel liner and cast-iron valve-seats. The Christofferson has somewhat similar design to the Wisconsin with the exception that the valve seats are threaded into the aluminum jacket and the cylinder head has a blank end which is secured to the aluminum casting by the valve-seat pieces. The Rolls-Royce engines show small differences in details of design in cylinder head and camshaft housing from the Mercedes on which patents have been taken out, not only abroad but in this country.

Funeral of Aviator Champion

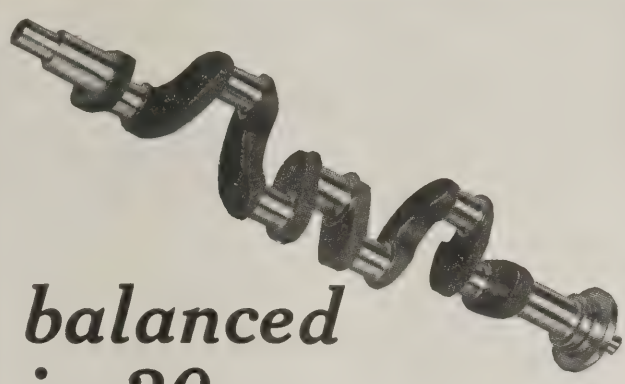
Kobe, Japan.—The funeral service in Kochi of Frank Champion, the American aviator, who was killed in an accident, was a remarkable demonstration of sympathy and sorrow.

The whole city of 30,000 people was in mourning and a procession a mile long followed the bier. There were 150 wreaths and other floral offerings. The streets were lined with people, some in tears, and the students in the schools stood bareheaded as the procession passed. The coffin was borne by Gov. Kakinuma of Hechi prefecture, Deputy Mayor Kawashima, Chairman Takahar of the prefectural assembly and others.

Numerous officials were present in the prefectural hall, where a solemn Christian service was conducted by the Rev. Nakushi of the Kochi Church. The governor, mayor and chairman of the assembly made addresses, in which they lamented Champion's death under such tragic circumstances. After the services the body was taken to a crematory. The ashes are being brought to Osaka by Lieut. Kumaki for conveyance to America.

London's Zeppelin Fires

Robert Adamson, Fire Commissioner, has received a report from the London County Council which shows, among other figures, the number of fires started in London by German Zeppelins in the air raids of 1916. According to this report, the London Fire Brigade responded to 129 fire calls resulting from the enemy air raids, of which 128 were fires. Two fires of serious proportions were included in the number started by Zeppelin bombs. A total of thirty-six persons were killed in these fires and twenty-six persons were rescued by the Brigade from fires caused by the airships. The fire loss due to this cause is not indicated.



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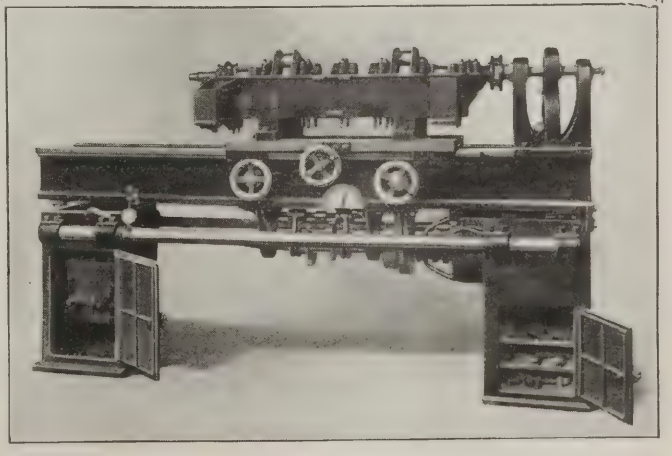
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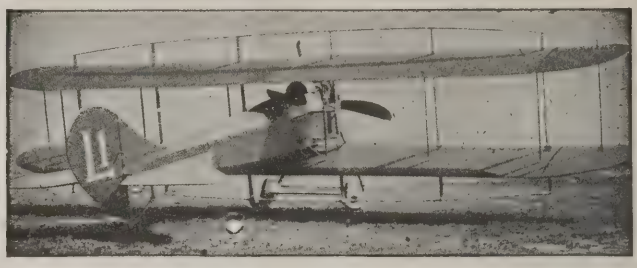
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WEEKLY

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AERONAUTIC EXPOSITION AN ASSURED SUCCESS

THE Second Pan-American Aeronautic Exposition and Aeronautic Congress, to be held at the Grand Central Palace, New York, Febraury 16 to 23, 1918, is an assured success.

As was the case last year, the exposition will follow the automobile and motor boat shows, and will be opened by an impressive function.

Governor Whitman Will Deliver Opening Address

Governor Whitman, of New York, has accepted the invitation to deliver the opening address, and leading Congressmen and American, French, British and Italian officials are to attend the opening function.

5,000 Delegates from 3,000 Cities, Towns and Organizations to Attend

Five thousand delegates of 3,000 cities, towns and scientific, educational and civic organizations are to be the guests of the Aero Club of America at the Aeronautic Congress, which is to be held at the same time as the Exposition, same as last year. The speakers at the Congress are to include the leading authorities in aeronautics and the programme of speakers and motion pictures is to be even more extensive than last year.

Technical Censors for the Show

To make sure that nothing is exhibited that will be of value to the enemy, the Aero Club of America has requested the Aircraft Board to appoint a Technical Censor. President Hawley's letter to Mr. Coffin, making this request, sent as we go to press, tells of the many things which are to make the Exposition an event of national importance, as follows:

MR. HOWARD E. COFFIN,
Chairman, Aircraft Board,
Washington, D. C.

My dear Mr. Coffin:

(1) Request is made herewith to the Aircraft Board for the appointment of a representative of your board to act as Technical Censor, or, in the event that you cannot spare an official for this purpose, that your Board advise in detail what it does not want exhibited at the Second Pan-American Aeronautic Exposition, to be held at the Grand Central Palace, February 16 to 23, 1918, so that we may appoint a committee of representative experts not connected with the Government to carry out your wishes.

(2) We have advised the exhibitors of the request of the now defunct Aircraft Production Board to the effect that "for military reasons no developments of new types of engines or planes can be exhibited." Also that the exhibits be limited in extensiveness, so as not to interfere with production of military equipment.

(3) The appointment of a Technical Censor, either by your Board or by the Aero Club of America, the Aircraft Manufacturers' Association, the Motors and Accessories Manufacturers' Association and the Automotive Engineers will insure the carrying out of the policy expressed by the defunct Aircraft Production Board and at the same time permit the carrying out of the national policy expressed by President Wilson in his request that everything possible be done to

> **"educate the country to its task . . . stimulating recruiting and patriotic interest in the war to the end that the utmost coöperation of all citizens in the successful prosecution of the war be secured."**

(4) Since President Wilson made this request, Secretary Baker and other authorities have publicly told how extensively the Italian and Russian reverses and some of our troubles in America were due to German propaganda which stirred up public discontent. Lord Northcliffe pointed out in his letter to Lloyd George, the British Prime Minister, on November 15, that the tragedies of Russia, Italy, Serbia, Roumania and Montenegro were due partly **"to lack of Allied propaganda to counteract that of the Germans."**

(5) Appreciating that the great public interest in aeronautics affords an exceptional opportunity to appeal to tens of thousands of peolpe to carry out the national policy expressed by President Wilson, we have invited 3,000 cities and towns to send delegates to the Exposition and to the Aeronautic Congress that will be held at the same time, and through them we expect to get the people and the newspapers of 3,000 communities to not only back up the Government in a general way, but to help the Government to achieve success in the following specific things:

> (a) Getting the people and newspapers of the 3,000 cities and towns participating in the Congress to realize the importance of subscribing to the Third and future Liberty Loans, thereby supplying the funds needed to train the thousands of aviators and build the tens of thousands of aeroplanes needed to secure and maintain the Allies' mastery in the air and strike Germany through the air.
>
> (b) Getting the people of these 3,000 communities to approve, and petition Congress, if necessary, to allow the appropriation of $1,000,000,000 needed immediately for military aeronautics to enable the aeronautic industry to prepare to produce to the full extent of its producing capaciy.
>
> (c) Getting the 3,000 communities so interested that they will assist the Aeronautic Divisions of the Army and Navy in getting men to enlist—particularly the men of from 19 to 21 years of age, who make best aviators, but are not within draft age; and expert men of over 31 years of age who are needed for non-flying duties.

(6) It is not necessary to have new developments in engines and planes in the Exposition to make it interesting to the public, the Automotive Engineers and to most Army and Navy officers. There are probably about 30,000 families who have sons in the Air Service who have never seen an aeroplane and will be as glad to see one as the people who visited the Electrical Show recently were glad to see the Standard military biplane—exhibited with the permission of the War Department.

There are also thousands of Automotive engineers and workmen connected with the aeronautic industries who have never seen any aeroplane or motor or accessories outside of what they do in their own shop.

The Exposition will give them an opportunity to see what others are doing and to educate themselves and become more efficient and of greater value to the country.

(7) The interchange of ideas between aeronautic engineers, manufacturers and inventors and the encouragement and inspiration which they can get through contact with public enthusiasm, will in itself be a valuable contribution of the Exposition to the upbuilding of our air forces.

(8) The exhibits of accessories, aeroplane and motor parts and the machinery used for manufacturing them will be especially interesting to the public and extremely valuable to the manufacturers who have been so busy that they have

not had the opportunity of looking for machines intended to speed up and cut down the cost of production. Speed in production means speed in breaking Germany's power. Cutting down the cost of production means saving to the nation, since orders are placed by the Government on cost basis.

(9) Great Britain, France and Italy have found Aero Shows the strongest factor in creating public interest and are giving every encouragement to those holding them. The Italian Aero Show, held at Milan early this year was attended by the Minister of War and his staff. The largest manufacturers exhibited, including the makers of the Caproni, Pomilio, Macchi, S. I. A. Savoya-Verduzio, S. A. M. L., aeroplanes. The motors included the Isotta-Fraschini, Fiat, Hispano-Suiza, Nagliati, Salmson, and others.

The accessories and machinery exhibited were even more extensive than the aeroplane exhibits.

Most attractive were the military exhibits of an extensive collection of war photographs shown by the Army, which also exhibited a collection of motors, showing the evolution of the aero motor beginning with the early Wright engine. Also captured German and Austrian machines.

The authorities found the show of great benefit. It popularized the war better than anything else before, drawing thousands of people and creating new enthusiasm among the aeronautic manufacturers and workers.

(10) We are sending you posters of the official Aero Show held in London and photographs of the Open Air Show held in Paris and of the show of official aeronautic paintings shown at the Aero Club of France, with the permission of the French Government, for two months.

11) You will be interested in knowing that all profits after deducting the expenses of organizing the Exposition and the 45 per cent., which is to be returned to the exhibitors, will go towards increasing the comfort and welfare of American aviators, mechanics and enlisted men in France and the United States. The Aero Club of America, the National Special Aid Society, and other coöperating organizations have already spent close to $50,000 in this work, and have supplied thousands of blankets, garments, gloves, overcoats, etc., and hundreds of thousands of cigarettes to the personnel of our air forces.

(12) We are asking Mr. Augustus Post, who has just returned from France and England, to take this letter to you and explain to you any other details regarding the Exposition.

We have authorized him to receive from you a letter authorizing to exhibit those manufacturers . . .

Also a letter stating whether your Board wishes to appoint the Technical Censor, or you wish the Aero Club, the Aircraft Manufacturers' Association, the Society of Automotive Enginers and the Motor and Accessories Manufacturers' Association to appoint a committee to attend to censoring.

Assuring you of our coöperation in every way that we can assist to build our air forces, I remain

Yours, very sincerely,
ALAN R. HAWLEY,
President, Aero Club of America.

AMERICAN AIRMEN IN ALLIED AIR OFFENSIVE

MAJOR JOSEPH TULASNE, head of the French Commission on Aeronautics, made some interesting comments on American participation in the Allied air offensive in the spring, to a representative of the Washington *Herald*. His interview follows:

"The Allies are anxiously awaiting the aid of the American air fleet. If this fleet comes in time for the 1918 battles, it will be the deciding factor.

"The summer of 1917 has been marked by very spirited battles for the supremacy of the air. During these battles the losses of the Allies have been great, but those our our enemies still greater.

Allies Profit by Lull

"At present we are getting ready to profit by the lull which the winter rains will cause in air raids, and organize large fleets of well-armed and equipped planes for the spring of 1918.

"The American people have understood admirably the part which American aviation is to play in this gigantic struggle, and the enthusiasm of the American people and its will to intervene in order to blind the army of the enemy has enabled Congress to pass an aviation bill of $640,000,000.

"The officers in charge of the organization and development of American aviation, and the business men who have spontaneously offered their services and business experience, have done a great deal during the last six months. Aviation schools have sprung up all over the country. Several are at present working at full speed. Hundreds of pilots, full of dash, are being trained there with the same zeal which they showed in the university games.

"American engineers, acting for the United States signal corps and the aircraft production board of the council of national defense, have designed and constructed a powerful motor, and the workshops for motors and airplanes are at the height of their organization and development.

Aeroplanes Ready

"In France and the other allied countries, provisions have been made to place at the disposal of American aviators the aeroplanes necessary to enable them to take part in the air battles of next spring.

"On the whole Western front, extending from the North Sea to Switzerland, the arrival of the American air fleet is anxiously awaited. This fleet must consist of a mighty battle fleet and huge bombing squadrons as well.

"The battle fleet is the decisive element in the supremacy of the air. The Allies must have a large number of pursuit squadrons, efficiently armed and piloted by daring aviators.

"The American fleet of battle planes will enable the Allies to secure indisputable supremacy of the air. But they must come at the earliest possible date and take their place in the struggle, because the supremacy of the air for 1918 will be decided during the first months of the spring.

"The American air fleet must therefore be at the front by early spring in great numbers. It will be there if American industry turns out its products quickly on a large scale.

"The American bombing squadrons also will contribute greatly to success. Since 1915, French aviation has been making bombarding raids. The raid upon Karlsruhe in 1915, made by twenty bombing planes, brought upon the Germans a justified terror. In that expedition over 200 persons were killed and wounded, and for many months that reprisal raid stopped German bombing of French towns. But in 1917 bombardment of defenseless English and French towns by German planes began again, in which London and Dunkirk suffered most.

"Public opinion in America has been aroused against these non-military bombardments, and has suggested reprisals. Such bombardments have been effected, Dresden and Frankfort, for example, having been visited by French planes.

"But the people of America must realize that it is much more difficult for the Allies to carry out bombing expeditions than for the enemy.

"The same distance which will take the German machines over London or Paris, will only take the Allied machines over Belgian or French towns in the invaded territory, and still quite far from important German towns.

"The problem of bombardment is more difficult for the Allies; this is why we should go at it with all our might.

"At the request of the French government, the government of the United States has decided to organize a powerful bombing fleet.

"These bombing squadrons, like the battle fleet, must be ready for action in the early spring.

To Bombard German Cities

"Then a systematic bombardment of open German cities carried out relentlessly day and night, without interruption—in answer to the bombardments the Germans have been carrying on for the last three years in violation of all laws of warfare—will contribute immensely to destroy the morale of the German people and to hasten an honorable peace.

"The sooner American planes appear on the French front, the sooner the war will be ended.

"Preparations must be made at the same time in Europe and in America.

"In Europe, great numbers of aeroplanes and engines of the type now used at the front will be built for the spring campaign. Simultanequsly, in America, these same planes and motors will at first be built to supplement the English and French factories, in order to have as soon as possible the maximum number of battle planes.

"Then the new aeroplanes, more powerful and better armed will be built to be used during the summer of 1918.

"The unlimited resources of American industry will make it possible to carry out these two building programs; first, to insure victory in the spring, which will soon be here, and second, to provide for the future by building machines with the latest improvements."



THE NEWS OF THE WEEK



Appoint R. F. Howe to Aircraft Board

Washington.—Appointment of R. F. Howe, of New York, a director of the International Harvester Company, as one of the civilian members of the Aircraft Board, which will be in charge of the development of the air service in this country, was announced after a conference of the aircraft production board with President Wilson. Howard E. Coffin, chairman of the present production board, also will head the new board. Its personnel will be completed with the appointment of another civilian member and the board's plan of organization was understood to have been discussed with the President.

Present at the conference were Secretaries Baker and Daniels, Mr. Coffin, Mr. Howe, and the other members, including army and naval officers and civilians. The board is being reorganized under an act of Congress to give it legal status.

Lord Northcliffe to Return Here on Aircraft Mission

London.—The *Globe* prints an interview with Lord Northcliffe, in which he says he will return to the United States as head of the British War Mission after the allied conferences and a trip to the fronts.

He said that if the British government desired, he would devote much of this time to the question of aircraft production in the United States.

Mr. Willard New Chairman of War Industries Board

The Secretary of War authorizes the following announcement:

The President has appointed Mr. Daniel Willard, president of the Baltimore & Ohio Railroad, chairman of the War Industries Board. He succeeds Mr. Frank A. Scott, who resigned because of ill health.

Mr. Willard is now serving as chairman of the advisory commission of the Council of National Defense. With the outbreak of the war Mr. Willard was among the patriotic men who quickly volunteered their services to the Government. Since that time he has unselfishly devoted his energies to the work of the Council of National Defense.

In appointing Mr. Willard to the chairmanship of the War Industries Board the President brings to its activities the services of one who already has familiarized himself, to a large extent, with the task ahead of the board and likewise has a general knowledge of the relations between industry and the war administration. He is an executive of well-established reputation and his selection was made in the interest of the continued efficiency and usefulness of the War Industries Board. Mr. Willard will enter upon his new duties immediately.

Flies 2,000 Miles, Raids Constantinople

London.—The Admiralty announces that a successful air attack in the vicinity of Constantinople has been carried out by a large British bombing aeroplane of the Handley-Page type which flew from England to a British base in the Mediterranean in a series of eight flights. The stopping places include Lyons and Rome, and the total distance covered was nearly 2,000 miles.

The machine was actually in the air thirty-one hours. This is believed to be a world's record for a cross-country journey and for the weight carried. During some parts of the flight strong winds and heavy rain storms were experienced, and there was one stretch of 200 miles over a mountainous country where it would be impossible for any machine to land.

Peary Says U-Boats Will Attack Cities

Rear-Admiral Robert E. Peary believes that German submarines will attack some American coast city in the near future. He added his word to that of Simon Lake, inventor of the submarine, at a meeting of women under the auspices of the League for Political Education in Carnegie Hall last week.

"I speak of no secret and I am giving no information that has not already been known or discussed when I say that a blow will be struck on some one or more of our Atlantic coast cities within a probably near future," said the Rear-Admiral. "When it comes it will come with the same startling effect as when the U-53 put into Nantucket."

Admiral Peary was speaking of the value of the aeroplane in war, commerce and for exploration purposes.

"Perhaps before this war is over, and certainly in the next war, these aeroplanes will carry as heavy artillery as the French 75s, and when that time comes the aeroplane will be invulnerable."



Miss Patricia A. Macaulay, daughter of T. C. Macaulay, the veteran American pilot, and her mammy. Miss Patricia is the pet of the Coronado. T. C. refers to the picture as a "study in black and white."

Mitchel Makes Denial That He is to Be Attached to the Department of Joint Aeronautics

The published rumors to the effect that Mayor Mitchel was to become a member of the Aircraft Production Board, of which Mr. Coffin has just been confirmed as Chairman, has been most emphatically denied by Mr. Mitchel. "It is totally untrue and without the slightest foundation," was his statement.

The rumor that was published had reference to Mayor Mitchel being made the head of the joint Army and Navy proposed Aeronautic Department, which the Sheppard-Hulbert bill of last April, provided for, but was pigeon-holed so shortsightedly by the Committee on military affairs at the last session. This bill or one on similar lines may be presented at this session as an Administration measure, and if it is there is no question that will become a law; and it is to be hoped that the first head of the department will be an expert, and not a politician.

Of the nine members of the Aircraft Production Board, there is still to be named one civilian. It is possible that the rumor had actual reference to this board and not to the proposed department of aeronautics.



Art Smith the American aviator, on tour in Japan, with some of the medals presented to him by Japanese civic and military organizations.

American Airmen Rescued at Sea

A French Port.—Suffering from cold, exhaustion and hunger, three American naval airmen were picked up by a French patrol boat on the night of November 24, after having been lost at sea for nearly sixty hours.

The three men, in a huge triplane hydroaeroplane, left a French base Thursday morning, November 22, in search of four enemy submarines which were reported operating off the coast.

When the men failed to return within the usual time fears were felt for their safety and other machines were sent out to search for them. The searching machines, however, returned after several hours and reported that they had seen no trance of the missing plane or its crew.

The naval authorities then sent out a general warning to all allied boats off the coast, and the search for the Americans was continued throughout Thursday night, all day and all night Friday, and throughout Saturday, with naval air machines assisting in the search during the daylight hours.

About dusk Saturday a French patrol boat saw the missing machine drifting helplessly several miles out at sea. A boat's crew rescued the three men, who were Ensign Kenneth Smith, a former Yale student, the pilot; Frank J. Brady of Newark, N. J., observer and gunner, and I. F. Wilkinson, mechanician.

The three men were virtually exhausted when picked up. They received first-aid treatment on the boat, which rushed them to this port, where they were transferred to a relief hospital. All the men have now recovered, and it is expected that they will be able soon to resume their duties.

The boat's crew was unable to save the hydroaeroplane, which was sunk at sea.

Defense Council Satisfied With Early Tests of Army Motors

Tests of the new heavy-duty Army truck have been so satisfactory that the Council of National Defense has let contracts for different parts of the truck without awaiting the results of the series of 24-hour runs now in progress. Deliveries are expected to begin in January and it is predicted that 10,000 trucks will be ready for service by June.

Endurance runs show the heavy truck capable of averaging 125 miles a day over heavy roads. The truck made a record of 3.95 miles per gallon of gasoline, hauling the full rated load of three and a half tons, in addition to four men. Designs for the light truck of one and a half tons rated capacity have been completed and the first two engines delivered. Only 16 days and 20 hours were required for the completion and delivery of the first engine.

Gabriele D'Annunzio at the Front

An official dispatch from Rome to-day says that Gabriele D'Annunzio, the aviator poet reported missing after a flight over the enemy lines, is at the front, displaying great activity.

Aviator Taken from Liner is Held as Spy

New York.—An aviator, believed to be employed by the German Imperial Navy, though he declares he is a Finn, will be turned over to the Federal authorities. He is understood to have given the name Kasper Wrede, twenty-seven years old.

The arrest was made on the liner Bergensfjord while she was preparing to sail yesterday with alien diplomats for Norway.

He went up the gangplank carrying a leather handbag weighing fifty pounds. For half an hour he strolled about the deck watching the examination of others. Then a Federal deputy suddenly took him into a stateroom to search him.

In his grip were specifications of aeroplanes and about fifty parts of aeroplane mechanism. There were notations in German on some of the drawings.

The prisoner said he had three pieces of baggage in the hold and that one contained an aeroplane motor.—New York *World*.

P. D. Armour 3d Enlists

Chicago.—P. D. Armour 3d, grandson of the founder of the Armour packing industry, enlisted to-day in the United States aviation corps, and was given a commission as a first lieutenant.

Armour is 31 years old, over the draft age, and is a vice-president of Armour & Company.

Open-Air Camp Service

Aviation Field, Mineola, L. I.—Members of the United States aviation squad and 1,000 civilians participated November 18 in the first open-air religious service held at Aviation Field 2, which joins Camp Mills. The service was such a success that it probably will be repeated each Sunday morning, weather permitting.

The services were conducted by the Rev. Roy F. Duffield, Archdeacon of the Episcopal Diocese of Long Island. He brought along with him a male chorus of about forty voices, and fifty of the aviators joined in singing at the service. The band from the 146th Oregon Field Artillery attended.

Camouflaging Truck Trains to Fool Enemy Aeroplanes

A large part of the time so far devoted to special manœuvres by army motor truck companies has consisted of experiments in mobile camouflaging. With enemy airmen concentrating their energies on attempts to drop bombs on fleets of trucks on their way to the front, the hiding of the fleets from the airmen's view by artificial means practically insures the regular delivery of large consignments of food, ammunition, clothing and supplies to the men in the trenches.

The men in charge of the camouflage experiments are all seasoned experts in their particular lines of business, and merely attached to the motor truck divisions for highly specialized work. This staff is composed of interior decorators, artists, photographers, sign painters, designers, landscape artists, engineers, architects and others who have made a success in professions of this nature.

Great success in this work has been achieved by Capt. K. G. Martin, in command of United States Truck Company No. 57, stationed at Camp Dodge, Iowa. This train consists of thirty-three White two-ton trucks, which saw 40,000 miles of service in Mexico. When the trucks were not being used for construction work the camouflaging experts have covered them with branches of trees and foliage to make them invisible, even at a short distance; paint and canvas have been used freely in designing false tops to make them blend into the general landscape; smoke screens have been experimented with and numerous other measures tested with satisfactory results.

Aeroplane Workers of Japanese Controlled Standard Aero Corporation Sworn to Loyalty

One thousand employees of the Standard Aero Corporation, which has large Government contracts for the manufacture of aeroplanes, were required to take the Federal oath of allegiance at the plant in Elizabeth, N. J.

Harry Bowers Mingle, counsel of Mitsui & Co., the Japanese fiscal agents, is the president of the Standard Aero Corporation.

P. D. Armour 3d, Is a Flier

Chicago.—P. D. Armour 3d, grandson of the founder of the Armour packing industry, entered the United States Aviation Corps, having been commissioned a first lieutenant. Armour is 34 years old, over the draft age, and is a vice-president of Armour & Co.

Tests Demonstrate Aeroplane's Value to Carry Wounded

Tests recently made on the Western front with an aeroplane fitted with two stretchers for carrying wounded have proved highly satisfactory. No wounded were carried during the tests, but Dr. Chassaing, of the Army Medical Service, and Corporal Tetu represented wounded passengers during a twelve minute flight, the equivalent of a fifteen mile journey.

Both the physician and the corporal declared that this form of transport is far superior to an ambulance, of which both have vivid recollections, having been wounded two years ago.

Dr. Chassaing, who removed a muffler from his head and unfastened straps during the flight, expressed the opinion that there would be no unnecessary pain to a wounded passenger, because the equilibrium of the aeroplane is so perfect. The machine was constructed by the aeronautic service of the army, which hopes to use this form of transport for the severely wounded.

Curtiss Sales Total $9,950,207

New York.—Gross sales of the Curtiss Aeroplane & Motor Corp. and subsidiaries for the nine months ended Sept. 30 totalled $9,950,207, divided as follows:

Sales of aeroplanes	$6,588,806
Aeroplane parts	1,433,101
Sales of motors	1,405,689
Motor parts	495,715
Miscellaneous	26,896
Gross sales	$9,950,207
Discounts and commissions	72,926
Net sales	$9,877,281
Manufacturing cost	7,163,642
Operating profit	$2,713,639
Selling, general expenses, etc.	764,059
Balance	$1,949,579
Other income	152,453
Gross profit	$2,102,032
Bond and other interest	209,886
Royalties	70,600
*Net profit	$1,821,566

*After allowing $315,000 as dividend for 9 months on the $6,000,000 preferred stock this leaves $1,506,566 for the 217,000 shares of common stock or $6.90 a share for the period. This is at an annual rate of $9.20 a share for the junior issue which is without par value. No allowance has yet been made for war taxes.

Balance sheet of the Curtiss Aeroplane & Motor Corp. and subsidiaries, as of Sept. 30, 1917, compares with statement of Nov. 30, 1916, as follows:

	Sept. 30, '17	Nov. 30, '16
Assets		
Land, buildings, equipment, etc.	*$3,675,918	*$1,163,711
Cash	142,101	280,256
Account and notes rec., less reserve	1,992,501	1,063,565
Inventories, less reserve	6,476,749	2,470,982
Investments	37,170	.....
Deposits on contracts	.....	103,743
Patents and good will	5,853,461	7,835,590
Deferred charges	337,268	287,773
Total	$18,515,169	$13,195,621
Liabilities		
Capital stock	†$7,087,700	$6,750,000
Bonds	3,773,000	.....
Notes	.....	4,000,000
Accounts and notes payable	4,422,030	615,934
Other current liabilities	106,092	.....
Minority interest, Toronto Co.	.....	58,689
Accrued interest, taxes, wages	159,970	.....
Reserve for contingencies	96,429	35,000
Deposits on contracts	762,709	911,524
Profit and loss surplus	2,107,139	824,474
Total	$18,515,169	$13,195,621

*Depreciated valuation.

†Comprises $6,000,000 preferred stock and $1,515,000 common stock, less $427,300 (85,460 shares) with trustee for conversion of notes.

The new plant of the company will be completed before the end of this week. Beginning Jan. 1 the Curtiss company will be turning out more than $9,000,000 of aeroplanes and parts a month. Of this record business $4,000,000 will be taken care of in the old plants and $5,000,000 in the plants to be completed this week.

Work has already begun on machines for the Government in several of the departments. The six months' business is estimated at $50,000,000. It is estimated that the company will be in a position by the close of next year to turn out close to $20,000,000 of aeroplane material a month or at an annual rate of $240,000,000.

Acosta Flies Speedy Continental Pusher

Equipped with a Hall-Scott 135 h. p. motor, the machine constructed by the Continental Aircraft Corp. is said to be the fastest pusher-type aeroplane in this part of the country. Bert Acosta, one of the most skillful of airmen, has flown the machine on numerous occasions, taking passengers whenever the weather permits. Wind is no bar to flying, and in a high wind the speed of the Continental pusher is tremendous.

Last Saturday and Sunday Nov. 25th, in spite of an extremely high wind, several flights were made at Central Park, L. I. Among the passengers taken up were Mr. Louis L. Kaess, President of the Continental Co., Vincent J. Buranelli, Chief Designer of the Company, and G. F. McLaughlin, of Aerial Age, who were given an opportunity of seeing what it was like to fight against a wind in a machine of high speed, at altitudes from two to three thousand feet.

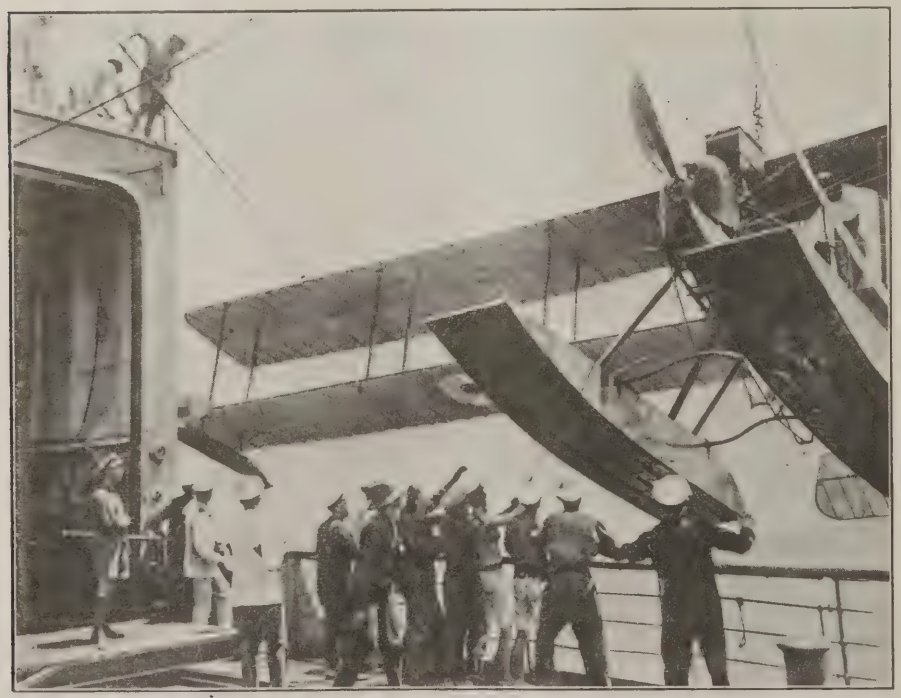
The flights were witnessed by Mr. Fageol, designer of the Fageol motor car, which is equipped with the same type of Hall-Scott motor as installed in the Continental aeroplane. Captain Bass took several "shots" of the machine with a new camera gun devised to teach marksmanship from aeroplanes and anti-aircrapt practice. The gun contains a roll of moving-picture film, upon which exposures are made as the gun-trigger is pressed. The imprint of a bull's-eye appears on each exposure, showing on the developed picture just how close to the object the marksman has aimed.

Color Vibrations to Cure Shell-Shocked Nerves

London.—A novel method for treating soldiers, suffering from shell-shock and overwrought nerves, by color vibrations is being made in McCaul's Hospital. The test is the idea of H. Kemp Prosser, a famous color expert.

"Shell-shock is a disease of the tissues of the brain," he said. "The correct vibrations of color will build them up. I plan to do away with the sense of confinement which affects the nerves by introducing color vibrations of out-of-doors. I paint the ceilings the color of the sky, the walls lemon-yellow, the color of sunlight, and use a few touches of green, the color of bursting buds. As a patient becomes stronger, I'll introduce stronger vibrations such as violet and orange."

One of the wards in the hospital is now being decorated under the direction of Prof. Prosser for tests upon shell-shocked officers.



Hoisting a seaplane of the Royal Naval Air Service on board a mother-ship after a reconnaissance flight over the North Sea.

Goodrich Rewards Suggestions from Employees

Akron.—The B. F. Goodrich Co. employs the suggestion ideas from employees on benefiting its production and recently distributed prizes for suggestions received in the past year. From 801 employees 1266 suggestions were received, the majority coming from the men but many from the women. One man had presented 25 suggestions and received prizes for four of them. The rewards are not made according to any fixed schedule. They vary with the nature of the suggestion, some beginning at $25 each and others as low as $9 each.

Lawson Aircraft Takes Over New Plant

Green Bay, Wis.—The Lawson Aircraft Corp. has taken over the new plant here, which has been in course of construction during the past three months. About 450 to 500 men can be employed in the plant. It is located diagonally across the corner of Pearl and Howard Streets from the shops which are now being used by the company. These same shops will also be kept in operation as well as the new plant.

Inland Piston Ring Offices Moved

St. Louis.—The Inland Machine Works, maker of the Inland piston ring, has removed the executive offices from 800 Mound Street to Broadway and Cass Avenue.

Personal Pars

H. E. Talbot, Dayton Metal Products Co., Dayton, O., and Noble Foss, president, Sturtevant Aeroplane Co., Jamaica Plains, Boston, Mass., were appointed to the Aeronautical Standards Division.

C. R. Murphy has been elected secretary of the Lawson Aircraft Corp., Green Bay, Wis., to succeed C. I. Smith, who resigned because of other interests.

Wire Wheel Co. Issues License

The Wire Wheel Corporation of America, whose general offices are at Buffalo, N. Y., and which succeeded to the business of the Houk Manufacturing Company, has granted a license under its basic patents, to they Dayton Wire Wheel Co. of Dayton, Ohio, to manufacture wire wheels for motorcycles, aeroplanes and Ford automobiles. The Standard Roller Bearing Co. of Philadelphia, Pa., and the Hayes Wheel Co. of Jackson, Michigan, are also operating under licenses covering these patents.

Close Watch on German Trade Preparations

German preparations for trade after the war are being scrutinized carefully by experts in the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, and the recent important report on the subject of "German Foreign-Trade Organization" by Chauncey D. Snow, which touched on this point, has been in such great demand as to establish a new sales record for Government trade reports.

Since the war eliminated Germany from world trade, the United States has improved its position in foreign markets in spite of the shipping shortage and other abnormal restrictive factors. Department officials point out that the future prosperity of the country will depend in part on Germany's loss of good-will in practically all foreign markets and in part upon American ability to maintain our new prestige. American business must not make the mistake of seeing only one side of this situation and thus underestimating the German capacity for foreign trade nor the energy, application, and craft with which German business will address itself to the task of regaining favor in markets in which it once prospered.

In order to understand the significance of the information on German trades moves that will from time to time be made public, Secretary Redfield counsels not imitation of, but familiarity with the German theories of foreign trade and the artful and formidable organization that with Government aid at every turn, has been built up in Germany during the last twenty years to dominate the world's markets. It was to meet the demand for such information that the Bureau of Foreign and Domestic Commerce issued the bulletin on "German Foreign Trade Organization." The unprecedented demand for it is taken as an indication that the American manufacturer is making after-war preparations of his own.

The Bureau now plans to get out a supplementary bulletin on German trade and preparations for the commercial future about the first of the year, and further supplements as rapidly as important additional information is received.

Ruth Law Wants to Fly for U. S.

Washington.—Ruth Law, the aviatrix, is in Washington seeking a commission as a flyer in the American Army.

She is very much in earnest, and after filing her application she said:

"If I am successful and am ordered to France, I will take my husband (Charles Oliver), who is experienced in the construction and repair of aeroplanes, and two expert mechanics. I was in France for six months and made numerous flights over the trenches and observation flights with British and French officers. I have been flying since 1912, so there can be no doubt as to my experience."

She holds the American non-stop flight record and has participated in Liberty Loan drives by dropping "bombs" in many cities.

Rear Admiral Fiske Hopes Torpedoplane Will Defeat U-Boat

Boston.—Hope that the torpedoplane may prove to be the effective answer to the German submarine menace, was expressed by its inventor, Rear-Admiral Bradley A. Fiske, U. S. N., retired, before the members of the Aero Club of New England.

"Much hope is felt by the allies now," he said, "because of the apparent loss of effectiveness of the submarine attacks. Whether or not the submarine has been beaten, let us realize that the submarine is only one of many naval weapons, and that naval strategy recognizes the fact that so long as an enemy's fleet exists as a fighting force, it constitutes a continuing menace, from which an attack of some kind may be expected at any time. For this reason, no mere subsidence of submarine activities should blind us to a desirability of sinking or disabling the German fleet.

"The strategical desirability of creating new and unexpected weapons in advance of war was not thoroughly realized till recently by any government except the German. It is unfortunate for the Allies that the German government realized it before they did so, because this priority has been a potent fighter on the German side. In fact, the principal single factor in whatever success the Germans have attained have been the new mortars with which they have battered in the tops of the Belgian forts, their novel appliances for trench fighting and their unexpectedly efficient submarines.

"Perhaps it is not too late to bring against the Germans a still later weapon, the torpedo-Perhaps it may be permitted us to hope that, as the monitor was the effective answer to the Merrimac, so the torpedoplane may be the effective answer to the submarine."

Americans Warned Not to Fly Over Spain

London.—A Madrid dispatch says the Spanish Government has issued a special warning Spain would regard any flight of American aeroplanes over her territories as violating neutrality.

The Government will instruct the military to fire on such aeroplanes.



The aeroplane presented by the Nottingham Chamber of Commerce to the New Zealand Government. It is of R. A. F. design and is known as the S. E. 4.

NAVAL and MILITARY AERONAUTICS

Notes of Chanute Field

Chanute Field was shocked Saturday evening, November 17, when word was received of the tragic death of Mrs. C. C. Benedict and her son Fred, aged five years, and Mrs. Conrad Behrens, all members of the officers' colony. Mrs. Benedict is the wife of Major Benedict, the head of the Reservists' Squadron at the field, and Mrs. Behrens was the wife of Capt. Behrens, who, on the day of the accident, had been promoted and given charge of the field hospital. The party of five were autoing in Champaign, where they were struck by an interurban car.

Major Benedict is a former football star of West Point, and at the time of the accident was the acting commander of the field, in the absence of Lieut.-Col. Jones.

It has been announced that Chanute field will be closed for flying on December 15, but that squadrons will continue to be stationed here and the mechanical work continued.

Lieut. John M. Foote, a Chanute Field officer, and H. W. Blakeley, the latter an expert for the L. W. F. Company, made a distance flight from Rantoul to San Antonio, the first ever made between these two points. The actual flying time of a trifle over eight hours for the distance is considered excellent, as they encountered several rain and snow storms.

United States Senator James Hamilton Lewis, of Chicago, made the main address recently at the ceremonies which marked the presentation of the new woman's building of the University of Illinois to the Government, for the use of the school of military aeronautics. The school will have much better facilities in the new building.

Jack Moran, St. Louis heavyweight boxer, says he is going to fight the Kaiser in the air. He is a student at the Champaign ground school.

Major Richard Blackmore, who has been head of the Chanute Field Hospital, has been transferred to Portland, Ore.

Special Orders 266

Second Lieut. Eugene Cotter, Aviation Section, Signal Corps, Reserve, is ordered to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aeronautical general supply depot and concentration camp, for assignment to duty.

The following named officers, Signal Reserve Corps, are assigned to active duty and will prodeed to Jersey City, N. J., and report in person to the commanding officer, 413th Telegraph Battalion (Railroad), 4th Regiment Armory, for duty with that organization:

Major Charles Gamble Baird, Capt. James Benjamin Crosley, Capt. Julian Douglas Jones, First Lieuts. Richard James Hubter, James G. Dennis.

First Lieut. Peter H. McNulty, Aviation Section, Signal Corps, is assigned to active duty and will report in person without delay to the chief, military intelligence section, War College Division, General Staff, for assignment to duty.

First Lieut. Louis L. Carruthers, Aviation Section, S. R. C., is assigned to active duty with station at Garden City, Long Island, N. Y.

By direction of the President, First Lieut. William H. Jilbert, S. R. C., is honorably discharged from the service of the United States, to take effect this date.

In Charge of Aviation Branch

Brig.-Gen. Alexander L. Dade, Signal Corps, has been relieved of the command of the Signal Corps Training School at San Diego, and has gone to Washington to take charge of the aviation branch in the office of the chief signal officer. Gen. Dade has been a colonel of cavalry, and was recently appointed to the Signal Corps. He is a West Pointer of the class of 1887. Gen. Dade relieves Col. Henry H. Arnold, Signal Corps, who has been appointed a member of the Joint Army and Navy Technical Aircraft Board.



Lieut. S. Herbert Mapes, A. S., S. C., U. S. R., for several weeks adjutant at the U. S. Army Aviation School, Camp Kelly, now in command of the 66th Aero Squadron.

Special Orders

First Lieut. G. V. Rotan, Av. Sec., S.R.C., to South San Antonio, Texas, for duty. (Nov. 5, War D.)

First Lieut B. J. Sherry, Av. Sec., S.R.C., to duty and report to Chief Signal Officer of the Army. (Nov. 12, War D.)

Second Lieut. H. H. Green, Av. Sec., S.R.C., to duty at Garden City, N. Y. (Nov. 12, War D.)

Second Lieut. H. S. Dow, Av. Sec., S.R.C., to duty at Garden City, N. Y. (Nov. 13, War D.)

Officers of Av. Sec., S.C., to duty as follows: First Lieuts. L. L. Carruthers and P. H. McNulty and 2d. Lieut. E. Cotter to Garden City, N. Y. (Nov. 14, War D.)



Lieut. G. L. Tilbrook, commanding officer 10th Aero Squadron.

First lieutenants of Av. Sec., S.R.C., to duty as follows: V. Kerens to Kelly Field, South San Antonio, Texas; M. Blumenthal to Garden City, N. Y.; D. Heald to Chief Signal Officer of the Army. (Nov. 15, War D.)

Officers of Av. Sec., S.R.C. to duty as follows: Capts. E. G. Lowry, A. G. C. Sage, L. H. Johnsan and 1st Lieut. D. L. Webster to duty at Washington; 1st Lieut. F. E. Kurz to Morrison, Va.; 2d Lieuts. D. W. Thomas and R. L. Cudworth to Chief Signal Officer of the Army. (Nov. 16, War D.)

Capt. J. S. Phipps, S.C., to duty at Ithaca, N. Y., school of Military Aeronautics. (Nov 10, War D.)

Officers of S.C. to duty as follows: Lieut. Col. J. C. Groome to Washington, War College Division, General Staff; 1st Lieut. J. A. McDevitt, jr., to Army Balloon School, Fort Omaha; 1st Lieut. G. M. Palmer to Kelly Field, Mass, Texas. (Nov. 12, War D.)

First Lieut. F. E. Evans, S.C., to duty at Garden City, N. Y. (Nov. 13, War D.)

First Lieut. J. S. Richardson, S. C., to duty at Army Balloon School, Fort Omaho. (Nov. 13, War D.)

Major W. C. Ocker, S.C., is rated as a junior military aviator, with rank from Nov. 2, 1917. (Nov. 14, War D.)

First Lieut. N. H. Harrin, S.C., to duty at Ground Officers' Training School, San Antonio, Texas. (Nov. 15, War D.)

First Lieut. G. M. Comey, S. C., to Garden City, N. Y., for duty. (Nov. 15, War D.)

The temporary promotion of the following officers of the Signal Corps is announced: To be colonels, with rank from Aug. 5, 1917—Lieut. Cols. D. J. Carr and L. D. Wildman. To be lieutenant colonel, with rank from Aug. 5, 1917—Major A. T. Clifton. (Nov 15, War D.)

Capt. B. C. Robinson, S. C., to Washington. Nov. 20, for duty. (Nov 16, War D.)

Capt. J. Howry, S. C., to Washington for duty. (Nov. 16, War. D.)

Master Signal Electrn, L. E. Harper, 1st Platoon, Co. D, 3d Telegraph Battalion S.C., from duty as operator in charge, Signal Corps Radio Station, Corregidor Island, to Manila for duty. (Sept. 21, Phil. D.)

Sergt. 1st Class R. H. Greyfield, Av Sec., S.C., is announced as being rated as an aviation mechanician, to date from Nov. 9, 1917. (Nov. 13, War D.)

An experimental aviation station has been established by the Navy Department opposite the Washington Navy Yard across the Anacostia River. A hangar measuring 100 to 200 feet, has been completed eighteen days after the work was started.

Major Edward P. Caurrier, Aviation Section, S.R.C., will report in person to the Chief Signal Officer of the Army for asignment to duty.

Second Lieut. Curtiss P. Snook, Aviation Section, S.R.C., will proceed to Kelly, South San Antonio, Texas, for assignment to duty.

First Lieut. Charles S. McDonald, Aviation Section, S.R.C., report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Alexander G. Donaldson, Aviation Section, S.R.C., will proceed on November 10, 1917, to the aviation concentration camp, Garden City, Long Island, N. Y., reporting to the commanding officer for duty.

First Lieut. Van E. Roddy, S.R.C., relieved from duty in Panama Canal Department to Little Silver, N. J., reporting to the commanding officer Camp Alfred Vail, for asignment to duty.

First Lieut. Edward W. Clark, 3d. Aviation Section, S.R.C., is assigned to active duty and will proceed to Washington, D. C., reporting to the Chief Signal Officer of the Army for duty.

First Lieut. John B. Golden, Aviation Section, S.R.C., is assigned to active duty and will proceed to South San Antonio, Texas, reporting in person to the commanding officer for assignment to duty, Camp Kelly.

First Lieut. John D. Albin, Dental Reserve Corps., to duty with Aviation Section, Signal Corps at Aviation School, Belleville, Ill.

Capt. Knight Dunlap, Sanitary Corps, National Army to duty with Aviation Section, Signal Corps, with medical research board, Washington, D. C.

First Lieut. Edwin M. Welch, Aviation Section, S.R.C., active duty at Garden City, Long Island, N. Y.

First Lieut. Lee Gilmore, S.R.C., to Camp Beauregard, Alexandria, La., for duty as camp supply officer; Capt.

Capt. Jones H. Kirk, S.R.C., to Camp Jackson, Columbia, S. C.

First Lieut. Greeley Munday, S.R.C., to Camp Sherman, Chillicothe, O., duty as camp supply officer.

Capt. Robert L. Patoon, S.R.C., to Camp Traverse, Fort Sam Houston, Texas, for duty.

First Lieut. Luther R. Foust, S.R.C., to cammanding general American Expeditionary Force for assignment.

First Lieut. Robert M. Bell, S.R.C., to Fort Oglethorpe, Ga., for duty.

Second Lieuts. Julian C. Douglas, James S. Collons, and Robert H. Lee, to Signal Corps Training Camp Fort Leavenworth, Kansas.

Capt. Andrew Jackson, MacElroy, Aviation Section, S.R.C., active duty at Hazelhurst Field, Long Island, Mineola, N. Y.

First Lieut. Alexander L. Dade, Jr., Aviation Section, S.R.C., to Chief Signal Officer of the Army for assignment to duty.

A board of officers to consist of—Major James Prentice, Signal Corps, Major Frank M. Kennedy, Junior Military Aeronaut, Signal Corps, Major Harold Geiger, Aviation Section, Signal Corps, Capt. Francis H. Poole, Medical Reserve Corps, and First Lieut. Frank W. Scott, Medical Reserve Corps, to meet at Fort Omaha, Nabraska, as an examing board.

First Lieut. Edward H. Miller, Aviation Section, S.R.C., to Park Field, Millington, Tenn., for duty.

First Lieut. Charles Miller, Aviation Section, S. R. C., to Chandler Field, Essington, Pennsylvania.

Capt. Wm. W. Laing, Medical Reserve Corps, from Toronto, Canada, to Plattsburg Barracks, N. Y., for temporary duty for examining candidates for aviation.

First Lieut. Wiley R. Buffington, Signal Corps, U. S. A., First Lieut. Eugene Shurley, Signal Corps, U. S. Army, First Lieut Wilder L. Walker, National Army, to Fort Leavenworth, Kansas.

Capt. Henry G. Pratt, Aviation Section, S.R.C., report to the Chief War College Division, General Staff for assignment to duty.

The following named officers, Aviation Section, S.R.C., on duty in aerial flights as follows: First Lieut. Frank P. McCreery, Sept. 5, 1917; First Lieut. Frank A. Dickman, Oct. 11, 1917.

First Lieut. Robert G. Macks, S.R.C., on duty in aerial flights from Oct. 9, 1917.

Second Lieut. Leroy A. Swan, S.R.C., is assigned to active duty and will proceed to Mount Clemens, Mich., reporting to the commanding officer Selfridge Field, for duty.

First Lieut. George E. Adams, S.R.C., is assigned to active duty at South San Antonio, Texas, Kelly Field, for duty.



One of the latest type scouts manufactured by the Whitehead Aircraft Co.—Surrey, England.

First Lieut. Mervyn F. Falk, S.R.C., is assigned to active duty and will proceed to Washington, D. C., reporting to the Chief Signal Officer of the Army for duty.

Special Orders 270 and 271

Capt. John W. Simons, Jr., Signal Corps, will repair to this city and report in person to the Chief Signal Officer of the Army for duty.

Capt. Stanley L. James, Signal Corps, will report in person to the commanding general, Philippine Department, for assignment to duty.

First Lieut. Walter H. Sears, Aviation Section, S. R. C., report in person to the president of the board of officers appointed in paragraph 236, Special Orders, No. 270, War Department, Nov. 19, 1917, for examination to determine his fitness for continuation on duty under his present assignment, and upon the completion thereof will return to his proper station.

First Lieut. Herbert G. Partridge, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for duty.

First Lieut. John C. Mahoney, S. R. C., is assigned to active duty and will report in person to the commanding officer, Camp Alfred Vail, for duty.

Second Lieut. William B. Gray, Jr., S. R. C., is assigned to active duty and will report in person to the department signal officer, Army Building, New York City, N. Y., for duty.

First Lieut. Paul C. Lacey, S. R. C., is assigned to active duty and will report to the officer in charge, Washington-Alaska Cable and Telegraph System, for duty.

First Lieut. Luther R. Foust, S. R. C., is ordered to active duty and directed to report to the commanding general, American Expeditionary Forces, for assignment to duty.

First Lieut. Paul B. King, Aviation Section, S. R. C., is assigned to active duty and will report in person to the commanding officer, Selfridge Field, Mount Clemens, Mich., for duty.

First Lieut. Robert Goodman, S. R. C., is assigned to active duty and will report to the commandant, Camp Alfred Vail, Little Silver, N. J., for assignment to duty with the 10th Field Battalion.

James B. Allison, Signal Corps, will proceed to Fort Leavenworth, Kansas; upon completion of this duty will proceed to Camp Alfred Vail, Little Silver, N. J.



One of the classes in the School for Instruction of the Royal Naval Air Service of Great Britain.



The Air Board of Great Britain in session. At the head of the table Lord Cowdray (who has just resigned), and seated around the table are Sir William Weir, Lieut. General Sir David Henderson, Commodore Paine, and Mr. Percy Martin.

First Lieut. Cyril J. Smith, Aviation Section, S. R. C., will proceed from Washington, D. C., to Langley Aviation Field, Hampton, Va., and report to the commanding officer for duty.

First Lieut. Henry Lancaster, S. R. C., will proceed to Camp Lewis, American Lake, Wash., for assignment to duty as supply officer.

First Lieut. Ervin W. Fish, Signal Corps, will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. August Smith, Signal Corps, will report in person to the commanding officer, Rich Field, Waco, Tex., for assignment to duty.

First Lieut. Frank T. Lloyd, Jr., Signal Corps, will report in person to the commanding officer, Selfridge Field, Mount Clemens, Mich., for assignment to duty.

By direction of the President, First Lieut. Nicholas J. Geopheghan, S. R. C., is honorably discharged.

Leave of absence of five days to take effect upon the completion of his present duties is granted Capt. Robert L. Patton, S. O. R. C.

The following named first lieutenants, Aviation Section, S. R. C., are announced as on duty requiring them to participate regularly and frequently in aerial flights from the dates shown after their respective names: Murray McConnell, August 20, 1917; John I. Moore, Oct. 18, 1917; Frederick P. Clements, Jr., Oct. 29, 1917.

First Lieut. Harry Wright Thompson, Signal Corps, will report in person to the commanding officer, Park Field, Millington, Tenn., for assignment to duty.

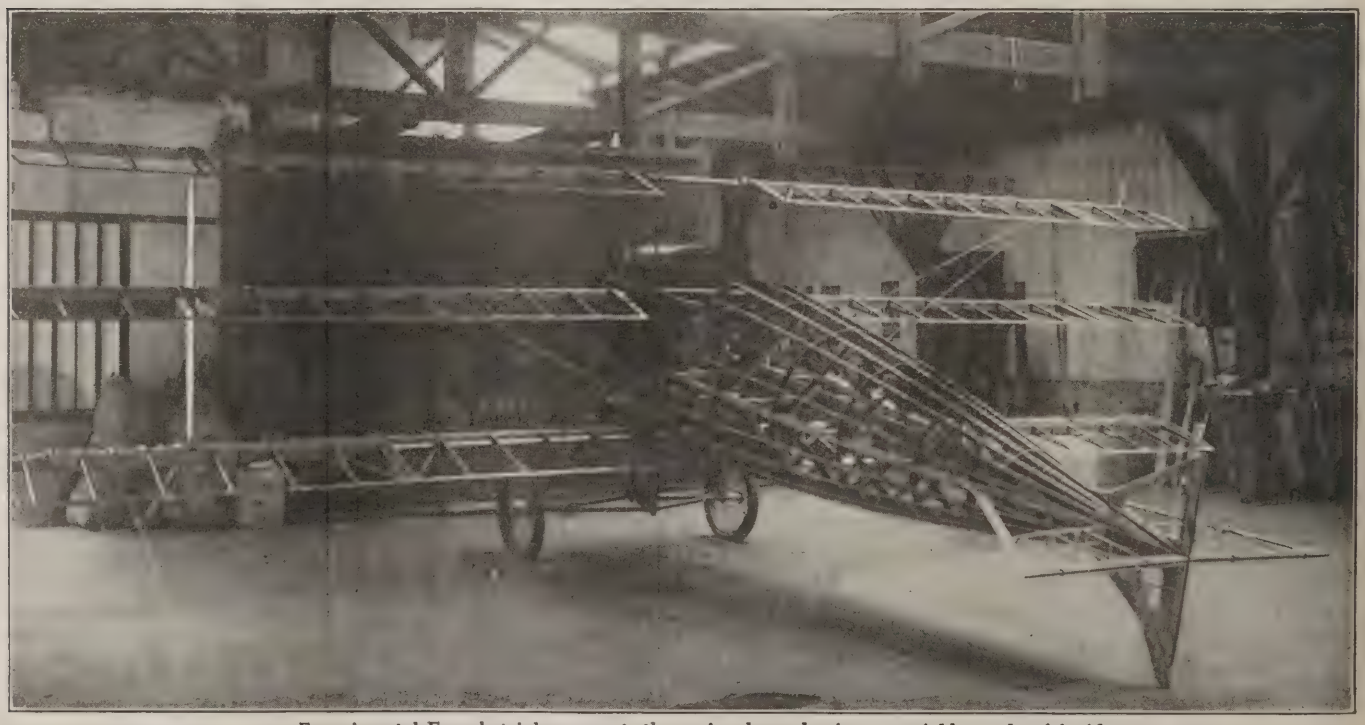
First Lieut. Thomas F. Randle, Signal Corps, will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for assignment to duty.

First Lieut. Roy N. Francis, Signal Corps, will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for assignment to duty.

First Lieuts. Charles R. D'Olive, Erie L. Hodge, John F. Brown, and John C. Bennett, Jr., Signal Corps, will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty with a squadron.

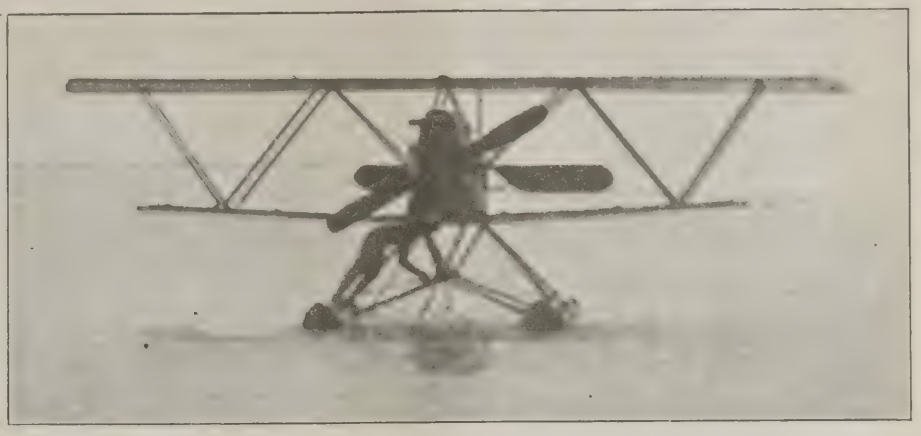
First Lieuts. Joseph Seymour, Donald MacDonald, Louis Gordon Slutz, and Brooke Edwards, Signal Corps, will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aeronautical concentration camp, that place, for assignment to duty with a squadron. The travel directed is necessary in the military service.

First Lieut. James H. Burgess, Signal Corps, will proceed to this city and report in person to the Chief Signal Officer of the Army for assignment to duty. The travel directed is necessary in the military service.



Experimental French triplane scout, the main planes having a variable angle of incidence.

THE S. V. A. FIGHTING SCOUT



IN the November 19th issue of AERIAL AGE, photographs and a short description of the Italian S. V. A. aeroplanes were published, and since that time further information has been obtained concerning them. The S. V. A. machines are manufactured by Gio. Ansaldo & Co., of Genoa, in a number of types quite similar to one another, the principal differences being in the wing spread and weight. In nearly all the types, the same propeller, motor and fuselage is used. With the exception of one of the types, the interplane strut bracing at either side of the body is arranged in the form of the letter *N*. The machine illustrated here is convertible for water use by replacing the landing gear with twin floats, as illustrated in the photographs.

All the material used in the construction of these machines is tested in laboratories before being installed, and again rigidly inspected when the machine has been tested out in actual flight. The woods are tested for transverse and longitudinal tension and compression, etc. Cables are from 8 to 10 times as strong as calculations show them to be necessary under extreme conditions. The silk-linen covering is somewhat transparent and after being treated with dope is practically untearable. Every piece of fabric and all the materials are submitted for examination by a staff of laboratory experts, and must have their approval before being turned over to the factory.

The dimensions given below were accompanied by the drawing shown on page 515. As these dimensions are more recent than those given in the description printed two weeks ago, they are probably more correct.

General Dimensions

Span, upper plane.....9100 mm (30′-2″)
Span, lower plane.....7600 mm (25′-0″)
Chord, both planes.....1650 mm (5′-5″)
Gap.....1800 to 1500 mm (5′-11″-4′-11″)
Overall length.....8100 mm (26′-7″)
Overall height.....3200 mm (10′-6″)
Weight, empty.....640 kg (1,411 lbs.)
Weight, loaded.....900 kg (1,984 lbs.)
Motor, SPA.....210 H.P.
Maximum speed....232 km (125 mi.) p.h.
Minimum speed.....82 km (45 mi.) p.h.
Climb in 14 min...4000 meters (13,123 ft.)

Main Planes

The planes are in four sections. The top plane is a flat span, but the lower plane sections are set at a dihedral angle. The wing curve has a negative tendency at the trailing edge, and the planes are given but a slight incidence angle or angle of attack. As in most of the fast Italian machines, the trailing edge is flexible, tending to flatten out the wing curve as the speed of the machine increases. A single set of ailerons are hinged to the upper plane.

The steel-tube interplane bracing is of streamline section, and attachment to the wing spar is by a pin running through the end of the brace, parallel to the line of flight. The bracing method employed is such that both the lift and landing stresses are taken by the struts, eliminating the wire bracing cables. Drift and anti-drift cables are used in the usual manner.

Main planes have a surface area of about 24.25 sq. m.; the loading of the machine is about 36.700 kg. (about 81 pounds).

Fuselage

At the forward end of the fuselage, the motor is entirely covered in, and the cowling runs back in a straight line as far as the pilot's seat. The rear curves of the under side of the fuselage are composed of a series of straight lines, and not a continuous curve. A noticeable feature of the fuselage is its narrowness in the vicinity of the tail plane, and its exceptional depth forward.

The interplane struts sloping outward from the fuselage are not connected to the upper longerons, but are carried part way down the vertical spacing members between the upper and lower longerons. Evidently a compression member is located at such points, running from one side of the fuselage to the other.



The S. V. A. fighter. Warming up the motor, preparatory to making an altitude flight. One of these machines ascended to 24,000 feet at a recent test in the United States.



S. V. A. scout equipped with twin pontoons, being prepared for service along the coast of Italy.

Veneer is used for covering in the body, except at the front end, where the aluminum cowling covers in the engine.

Tail Group

The leading edge of the tail plane is located at the level of the center of propeller thrust, as indicated on the drawing by the dotted and dashed line, and the plane is fixed at a negative or depressing angle. It will be noticed on the plan view of accompanying drawing that the tail plane, or horizontal stabilizer, is exceptionally small, its area being only slightly more than half the area of the elevators or tail flaps. The flaps are worked with short control tillers located close to the body. A pair of steel struts support the tail from the fuselage.

The familiar triangular fin or vertical stabilizer is used, with the rudder hinged to its trailing edge. The lower end of the rudder is carried in a cupped metal fitting attached to the under side of the fuselage termination.

Control wires run into the body through protective metallic plates with friction-reducing guides.

Landing Gear

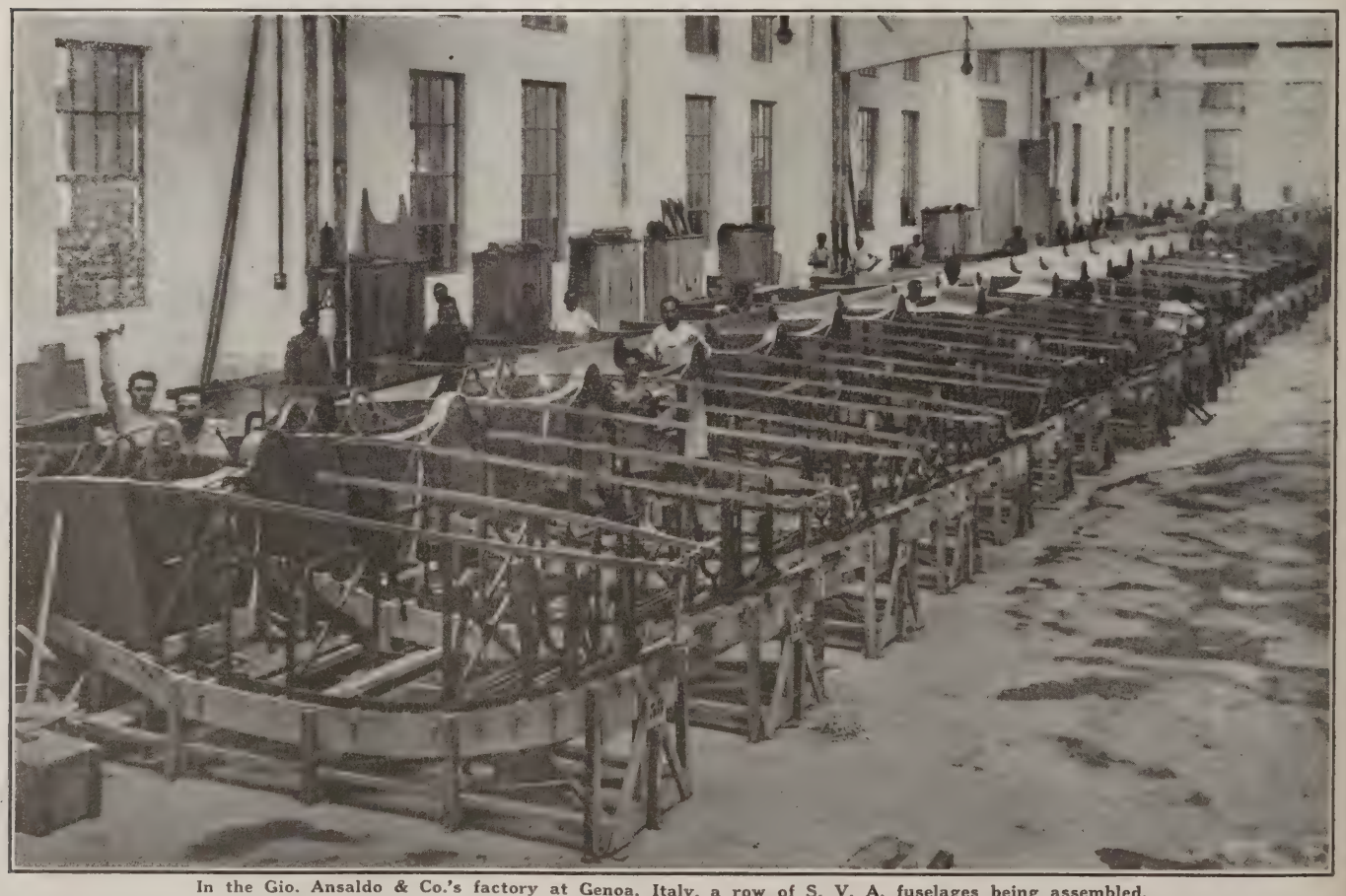
Steel tube chassis members carry the floating axle, cross wired in the usual manner. The shock absorbing rubber elastic is covered in to reduce skin friction.

The tail skid is unusual inasmuch as it relies upon a steel leaf-spring skid for its shock-absorbing effect. The upper end of the spring is rigidly clamped to a metal container, from which supports are run to the upper longerons of the body and to the tail plane.

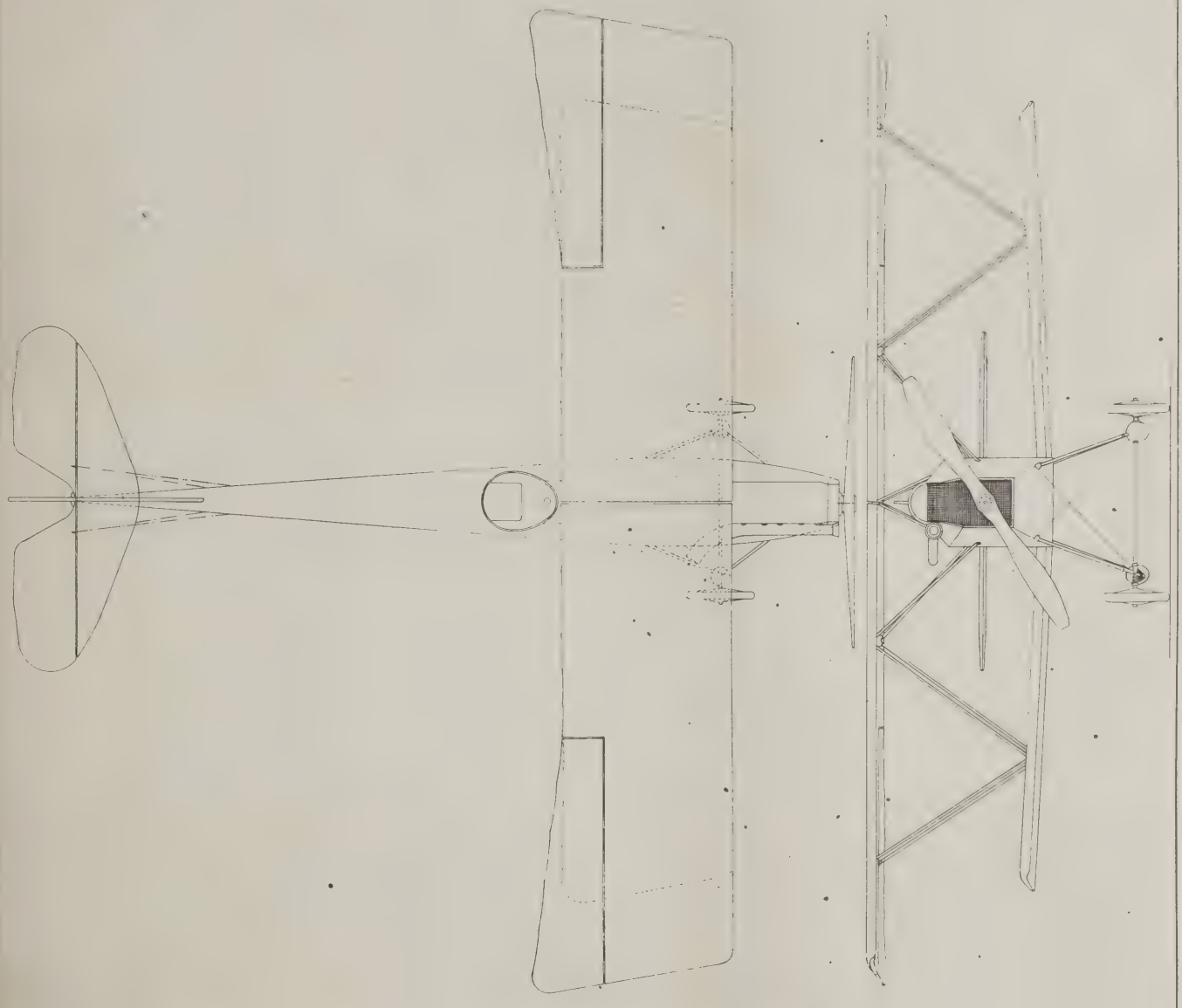
Motor Group

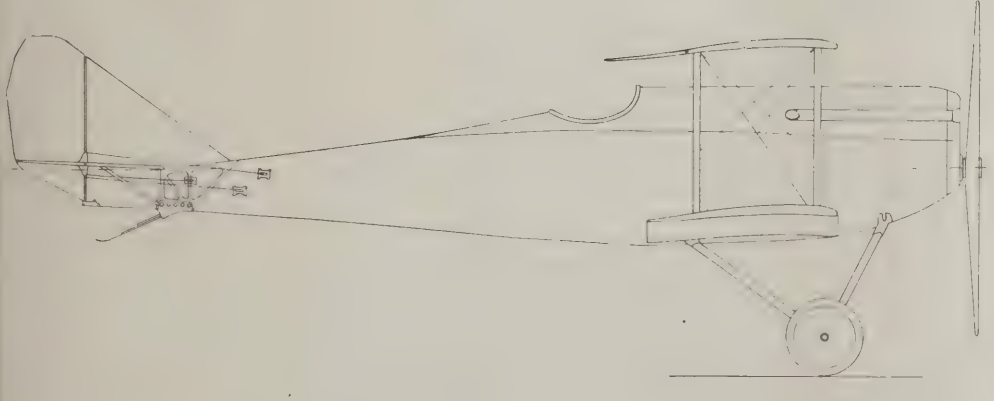
The engine is a 6 cylinder SPA developing 210 h.p. at 1,600 revolutions per minute. Further details of the charac-

(*Continued on page* 523)



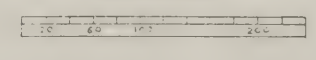
In the Gio. Ansaldo & Co.'s factory at Genoa, Italy, a row of S. V. A. fuselages being assembled.





THE ITALIAN S.V.A
210 HP SPA MOTORED
FIGHTING SCOUT

CENTIMETERS



McLaughlin

THE GROUNDING OF A FLIER

By a Lieutenant of the Aviation Section

A GROUP of 36 well set-up young Americans, the summer's tan just fading from their faces, are closely studying a battle field. Within six feet of them is the rapid flash of shells bursting in quick succession—not real shells, but as close an imitation as desirable in a lecture hall—and the men are behaving with the sureness and precision which, as future officers and pilots of America's great aerial battle fleet, they are expected to display.

After each explosion, or, rather, flash, is heard the buzz of the wireless as the men take or send a message from "somewhere"—in California, or Massachusett's, or Illinois, as the case may be.

A second group of pilots, looking down upon the others, are seated in cockpits high above the miniature battle field. They hear the imaginary roar of Pershing's guns, and there is another succession of lightning flashes on various squares of the military map below them.

"Buzz-z-z, Buzz-z-z!" goes the wireless, as in actual warfare, where artillery fire is directed by the "eyes of the army"; the pilots from the top of the scaffold observe the location of "hits" by the artillery and signal the range to the gunners—in this case instructors—below.

"W-29D-7-9" is the message to the artilleryman—cryptic, of course, to those who do not understand the squared map and pin-point system in use by aerial observers on the western front. Perhaps it is a prearranged shoot, in which case the clock code is handy for signalling how close the "hits" come to the dugouts of Kaiser Wilhelm's privates, or trench crossings filled with huddled groups of the same, or whatever else the target may be.

W-4, B-6," sings the buzzer. And the United States artillery officer corrects the range of his big gun to suit; at least, he will do so a short time hence, when our young pilots now in training get the first real opportunity of showing their mettle to the enemy across the Rhine.

The foregoing is a few minutes' work in what is a part—a very small part—of the program of one of the United States schools of military aeronautics, more commonly known as "ground" schools. The man in the street has a fair knowledge of what our *flyers* are doing. By sight and hearsay he is beginning to know of the work at our many flying fields, from the outskirts of which may be heard the roaring buzz of motors in the air as the bird men make spirals right and left, do figure "8s," make turns around pylons with all parts of the machine kept within a designated radius, or glide along with motor throttled, like seagulls flying on outstretched wings. As for war conditions, the average citizen carries a vague picture of swooping bird men, loops and spiral dives, rapid-fire duels high above the clouds, etc. But the man in the street knows nothing of the eight weeks' milling that these lads go through before even stepping into a fusilage and proudly calling "contact"—to set the motor revolving for their first ascent. In other words, he knows nothing of our ground schools for the fundamental training of aviators, of their startling development and rapid progress, and, incidentally, of the man at the helm—recently promoted to the rank of lieutenant-colonel for his successful work—Hiram Bingham, Signal Corps, U. S. A.

The birth of the schools of military aeronautics came about quite suddenly. To boil it down into a few words, it so happened that Lieut.-Col. Bingham, at that time a Yale professor, deeply interested in aviation as a vital and, probably, determining factor of the great war, was making a good many flights and studying the subject from the ground up, with an eye to becoming an aviation instructor. The age limit debarred him from active service.

On May 1 Gen. George O. Squier, Chief Signal Officer, U. S. A., commandeered his services and wired for three professors from each of the universities in whose neighborhood it was proposed to put the schools into operation. Lieut.-Col. Bingham and his band of professors jumped up North, made a rapid but inclusive inspection of the schools of military aeronautics of the Royal Flying Corps, Toronto, Canada, upon whose methods, to a large extent, our schools have since been developed; held prolonged conferences as to ways and means of organization, and within the record time of 10 days had six good American ground schools started on a definite program. Two other schools were shortly added to this list.

The American schools are located at the following colleges: University of California, Cornell, Georgia School of Technology, Princeton University, University of Illinois, Massachusetts Institute of Technology, Ohio State University, and University of Texas. Although they have taken over a large part of the technical apparatus and some of the instructors of the universities on whose grounds they are situated, it is to be noted that they are in no sense a part of the university or of the ordinary university course. They are Army posts administered and supplied by the Schools Section, Air Division of the United States Signal Corps.



Major-General George O. Squier, Chief Signal Officer, U. S. A., Member Aircraft Board.

The course of training is necessarily intensive. Within the comparatively short space of eight weeks there is crammed into the ground-school cadet the heaviest diet of military fundamentals, scientific and technical essentials of flying that he can possibly digest—and a little more. Col. Bingham's theory (a successful one, judging by the quality of flyers) is that the man who can assimilate within a given time an overdose of the above kind of work is also the man who can keep his mental and physical poise under the strain of battle flying in modern warfare. Ground-school candidates are, therefore, discouraged from studying subjects ahead of time with the particular purpose of passing examinations the more easily. Nevertheless, the curriculum presupposes a certain amount of previous knowledge and a sound intelligence, for the instructor can not stop to teach a candidate the ABCs. The instructors are rushed. The men are rushed. And the war won't wait.



Colonel Hiram W. Bingham, in charge of Ground School activities of the Aviation Section of the Signal Corps.

It is taken for granted by the United States Air Service, as it is in other countries, that the work requires, first of all, men of the best possible officer material—athletic, quick of thought and action, and trained in discipline and military elementals—but, above and beyond all that, it requires men suited for the particular job of military aviation. The first three weeks of the ground-school course—known as the junior wing—is devoted to military studies. This includes infantry drill in the school of the soldier, the school of the company, physical training, and first aid. At the same time there are lectures on military courtesy, organization and administration of the United States and modern European armies, Army paper work, military hygiene, etc. The junior wing also receives daily instruction in the use of a machine gun and in wireless telegraphy.

The men rise at 5.30, and calisthenics occupy their time, with a recess for mess, until 8 o'clock, when school opens. After a brief stop at noon they are hard at it again, drilling until school, at 4 o'clock. Evening finds no let up, for school and study occupy the hours until taps, at 9.30, by which time they are thankful to get between the sheets.

And well they may be. The following daily program of studies will serve as explanation:

Service calls.

Daily:	
Reville, first call	5.30
Assembly	5.45
Calisthenics until	6.00
Mess, first call	6.15
Assembly	6.20
Inspection, first call	7.20
Assembly	7.25
Saturday morning inspection—first call assembly:	
Telegraphy	7.30
School, first call	7.55
Assembly	8.00
School, first call	8.55
Assembly	9.00
School, first call	9.55
Assembly	10.00
School, first call	10.55
Assembly	11.00
Recall	12.00
Mess, first call	12.10
Assembly	12.15
School, first call	1.55
Assembly	2.00
School, first call	2.55
Assembly	3.00
Drill, first call	4.00
Assembly	4.05
Recall	5.00
Retreat, first call	6.05
Assembly	6.10
Mess call	6.15
School call	7.30
Tattoo	8.30
Taps	9.30

The senior wing subjects start in the fourth week, from which time on the following outline is typical: By the time a student has absorbed during this week the theory of flight, engines, telegraphic signaling, and the use of intricate aerial instruments (such as compasses, air-speed indicators, inclinometers), he decides that he has become a master of air subjects. Classes in rigging, repair of machines, and types of machines are scheduled for the fifth week, while the study of telegraphic signaling, engine, laboratory, and machine guns is still continued. During the sixth and seventh weeks are given lectures on radio-telegraphy, fighting in the air, map reading, meteorology, bombs, and aerial photography.

The close of the eighth week brings the examination in gunnery. Artillery observation is also on the program, and it is in connection with this work that we find the candidate at the beginning of the article engaged on the fascinating miniature range.

About 2 o'clock on Saturday afternoon the candidate usually learns his fate. Perhaps only 16 or 17 of the original class of 25 who entered eight weeks before remain to graduate. But those who do have mastered the basic principles of military aeronautics, which, as Army men are learning more thoroughly every day, is a vital prerequisite to any training in the air.

All these ground-school candidates are enlisted in the Signal Corps or the Signal Enlisted Reserve Corps, where their status is that of "flying cadets." As soon as they are fortunate enough to pass the test for reserve military aviators they receive an officer's commission, with the regular pay therefor, and officers receive what is known as commutation of quarters at all places where no public quarters are available.

Beyond this, in the case of foreign duty, is

a 10 per cent. extra allowance provided for by law to officers serving beyond the limits of the United States and Territories contiguous thereto, with the exception of the Canal Zone, Panama, Porto Rico, or Hawaii. In addition to the above, aviation officers who are on duty requiring them to participate regularly and frequently in aerial flights will receive a 25 per cent. increase in the pay of their grade.

The foregoing is a brief sketch of the working methods of the Aviation Section of the Signal Corps of the United States Army. The ground schools are still in their infancy, although their growth has been abnormal. From day to day aerial tactics and instructional methods are changing, and will continue to change in accordance with new conditions. The ground schools form the preliminary step in the great task of sending across the German trenches aviators mentally, morally, and physically equipped for their work.

A brigadier general in the British aviation corps remarked the other day: "The longer the war continues the more we realize the vital necessity of the work done in ground schools and the need for learning more and more subjects which, previously, were not taken up until the would-be flyer stepped into his machine."

The French war office figures that a pilot and observer who, fully trained, mounted, and equipped, crosses the enemy trenches for the first time represents a total investment of $25,000.

The British figure that a fully trained pilot, under the same circumstances, represents an investment of $6,000, the observer $3,000, and the two-seated machines $10,000, not to mention other overhead expenses, which bring the figures up to virtually the same total as the French. If for no other than financial reasons, the tremendous importance of the ground schools must be appreciated, not only in laying the proper foundations of this training but in weeding out the poor material and making the utmost of the good material.

Every week our flyers are fast graduating from ground schools to the training schools and from the training schools to service overseas. And more and more men are needed to fill the gaps. It is reported that many young men shy from aviation because fearing they lack the proper physical qualifications. No peculiar attainments are necessary; the service is not limited to trapeze performers or jiu jitsu experts. As the War Department stencil says, "It must be remembered that the flying officer is not 'an aerial chauffeur' or 'exhibition flyer.' He has been more correctly defined as a twentieth century cavalry officer mounted on Pegasus."

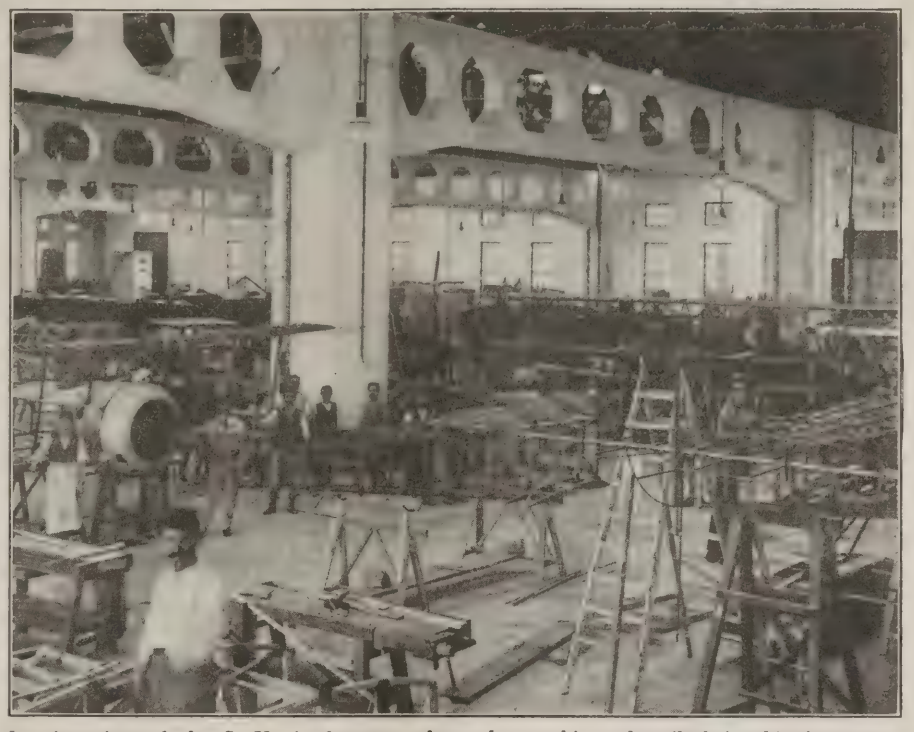
Physically speaking, what is most of all desired is a sound, strong body, with particular attention paid to eyes, nerves, and ears. Perfect eyesight is a sine quo non. Provided they are otherwise acceptable, candidates of light build and more youthful appearance than desirable for line officers will be given a chance. They should be at least 19 and preferably not over 30, "although in exceptional cases," to quote the official announcement, "older men of pronounced athletic attainments who have spent most of their lives out of doors, in the saddle, ranching, playing polo, mountain climbing, or in actual flying, may be accepted if they can satisfy the examining board of their physical fitness."

Learning to Fly

In his preface the author of this work states very truthfully that among the 2000 aeronautical books now in existence few are adapted for use at text books among the 30,000 or more aviation students in this country. The present volume is especially welcome since it fills this need and may be highly recommended both to the laymen and the student who actually flies. The main object of the book is to enable the student to properly understand his aeroplane, to keep it tuned up and to operate it in cross country flights as well as at the flying school. The treatment of the subject parallels the instruction given under the authors directions in the U. S. Ground School of Military Aeronautics in the University of Illinois Branch. The style of the book is clear and concise and well adapted to the comprehension of the beginner. The more technical terms are avoided as far as possible.

The history of aviation is first discussed with the idea of instructing the student in the control of his machine. The various types of military areoplanes are explained and illustrated in detail together with the principles of flight. In an especially interesting chapter on Flying the Airplane the author offers much practical advice on the control of the machine in rising and landing, while in the chapter dealing with Cross Country Flying the student will find much valuable information concerning aerial navigation. One of the detailed chapters of the book deals with the rigging of aeroplanes and many pages are devoted to instruction in erecting machines. The instruction is given as far as possible in tabloid form, and the student finds his studies greatly facilitated. The book should be found in the library of every student of aviation.

Learning to Fly in the U. S. Army, by Prof. E. N. Fales. This book can be obtained from The Aeronautic Library, 280 Madison Avenue, New York City. The price is $1.60 postpaid.



Interior view of the S. V. A. factory where the machines described in this issue are manufactured.

Plane Propeller Pitch Regulated in Flight

In an attempt to increase flexibility and efficiency, a adjustable pitch propeller has been developed for aeroplanes says the December *Popular Mechanics Magazine* in an illustrated article. Both the lock and the flying tests have been conducted and satisfactory results reported. Complicated construction has been avoided and positive control provided. A pilot can change the propeller pitch while in full flight and thus make compensation for whatever atmospheric condition is encountered. He accomplishes this even more easily than a motorist shifts the transmission gears of his car. In purpose and effect the two operations are practically analogous.

$500,000 Aeroplane Engine Storage House for Indianapolis

Indianapolis, Nov. 18—The Federal Government has awarded a contract for a concrete aeroplane engine storage house near the Indianapolis Motor Speedway to cost about $500,000. The building will be 1,200 feet long and 500 feet wide.

Lieut. Thurlow to Wed Miss Hope Malcom

One of the most interesting of recent engagements was announced by Mrs. George Ide Malcom, of 116 East Sixty-third Street, that of her daughter, Miss Hope Malcom, to Lieut. Charles Thurlow, Jr., son of Mr. and Mrs. Charles Thurlow, of Newburyport, Mass. Like so many other young women of society, Miss Malcom has chosen for her future husband one of the young men who have given up peaceful pursuits to answer the call to the colors. Lieut. Thurlow was graduated from Harvard in 1912 and is now in the aviation section of the Signal Corps.

Miss Malcom's father was the late George Ide Malcom. She was introduced to society several winters ago, and is a member of the Junior League.

Her brothers, Messrs. J. Benham Malcom and George Ide Malcom, Jr., are in the Naval Reserve, and another brother, Mr. Julian Malcom, is a candidate for a commission in the United States Army.

No date has been set for the wedding.



Fuselages of the Italian S. V. A. fighting scouts being assembled.

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications.

Specifications For Ingot Copper

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. (*a*) Copper may be either lake copper originating on the northern peninsula of Michigan, U. S. A., or it may be electrolytically refined copper.

Analysis.—(*b*) The copper in all shapes shall have a purity of at least 99.880 per cent, as determined by electrolytic assay, silver being counted as copper.

Sampling.—(*c*) One bar, cake, billet, ingot, or slab shall be taken for analysis from each lot of 5,000 pounds (2,268 kg.) or less, but not more than 10 bars, cakes, billets, ingots, or slabs need be taken from a carload.

IDENTIFICATION AND MARKING.—3. All wire bars, cakes, slabs, and billets shall be stamped with the maker's brand and furnace charge mark. Ingots and ingot bars shall have a brand stamped or cast in, but need have no furnace charge mark.

DELIVERY, PACKING, AND SHIPPING.—4. The refiner shall arrange carloads or lots so that as far as possible each shall contain pieces from but one furnace charge, in order to facilitate testing by the user.

References: A. S. T. M. Specifications B5-13.

Specifications For 7 x 19 Extra-Flexible Steel-Wire Cable

GENERAL.—1. (*a*) This specification covers the finish, material, and construction of high-strength steel wire cable composed of tinned-coated steel wires twisted concentrically around a tinned-steel wire center, thus forming a strand and such strands twisted concentrically around a central strand of the same construction forming a cable.

(*b*) The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The wire shall be manufactured of either I. A. S. B. Standard Steel No. 1065, No. 1070, or No. 1080, the compositions of which are listed below.

MANUFACTURE.—3. (*a*) The steel wires composing the individual strands of cable shall be laid concentrically around the center wire in one layer of 6 wires and another, or outer layer, of 12 wires with a left-hand (counter clockwise) pitch, the lay or pitch of both layers being of the same length; the cable itself shall be constructed by twisting 6 of these strands composed of 19 wires each around a seventh strand of the same construction and material with a right-hand (clockwise) pitch or lay of 6 to 8 times the diameter of the whole.

It is not to be understood that the strand composing this cable must necessarily be composed of wires of the same diameter.

(*b*) The steel from which the wires composing the cable are drawn shall be manufactured by the acid open-hearth process.

(*c*) Wires composing the cable shall be uniformly coated with pure tin to solder readily.

(*d*) Joints in wires in cable having a diameter of 0.187 (3/16) inch (4.76 mm.) and larger shall be brazed in a gas fire. In cable having a diameter of 0.156 (5/32) inch (3.97 mm.) or less, wires may be joined either by brazing or twisting at the manufacturer's convenience. Tucked in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable, than 30 feet (9.14 meters).

Reels for cable.

ENGLISH UNITS.

Diameter of strand or cable.	Diameter of head.	Traverse or distance between heads.	Diameter of bundle.	Diameter of arbor hole.	Diameter of head.	Traverse or distance between heads.	Diameter of bundle.	Diameter of arbor hole.	Diameter of head.	Traverse or distance between heads.	Diameter of bundle.	Diameter of arbor hole.	Diameter of head.	Traverse or distance between heads.	Diameter of bundle.	Diameter of arbor hole.
	1,000 feet.				3,000 feet.				5,000 feet.				10,000 feet.			
Inch.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
1/32	12	4	8	1 1/8	12	4	8	1 1/8	12	4	8	1 1/8	16	4	10	1 1/8
1/16	12	4	8	1 1/8	12	4	8	1 1/8	16	4	10	1 1/8	16	7	12	1 1/8
5/64	12	4	8	1 1/8	16	4	10	1 1/8	16	7	12	1 1/8	16	10	8	1 1/8
3/32	12	4	8	1 1/8	16	4	10	1 1/8	16	7	12	1 1/8	16	10	8	1 1/8
7/64	16	4	10	1 1/8	16	7	12	1 1/8	16	10	8	1 1/8	18	10	8	1 1/8
1/8	16	4	10	1 1/8	16	7	12	1 1/8	16	10	8	1 1/8	24	10	10	1 1/8
9/64	16	7	12	1 1/8	16	10	8	1 1/8	24	10	10	1 1/8	24	16	10	2 1/8
5/32	16	7	12	1 1/8	16	10	8	1 1/8	24	10	10	1 1/8	24	16	10	2 1/8
11/64	18	7	12	2 1/8	18	10	8	2 1/8	24	10	10	2 1/8	24	16	10	2 1/8
3/16	18	7	12	2 1/8	18	10	8	2 1/8	24	10	10	2 1/8	32	20	16	3 1/8
1/4	18	10	10	2 1/8	24	10	10	2 1/8	32	18	16	2 1/8	36	22	18	3 1/8
5/16	18	10	10	2 1/8	24	10	10	2 1/8	32	18	16	2 1/8	36	22	18	3 1/8
11/32	18	10	8	2 1/8	32	16	16	2 1/8	32	20	16	3 1/8	50	16	26	3 1/8
3/8	18	10	8	2 1/8	32	16	16	2 1/8	32	20	16	3 1/8	50	16	26	3 1/8

METRIC UNITS.

	305 meters.				914 meters.				1,524 meters.				3,048 meters.			
mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
0.794	305	102	203	28.58	305	102	203	28.58	305	102	203	28.58	406	102	254	28.58
1.588	305	102	203	28.58	305	102	203	28.58	406	102	254	28.58	406	178	305	28.58
1.984	305	102	203	28.58	406	102	254	28.58	406	178	305	28.58	406	254	203	28.58
2.381	305	102	203	28.58	406	102	254	28.58	406	178	305	28.58	406	254	203	28.58
2.778	406	102	254	28.58	406	178	305	28.58	406	254	203	28.58	457	254	203	28.58
3.175	406	102	254	28.58	406	178	305	28.58	406	254	203	28.58	610	254	254	28.58
3.572	406	178	305	28.58	406	254	203	28.58	610	254	254	28.58	610	406	254	53.98
3.969	406	178	305	28.58	406	254	203	28.58	610	254	254	28.58	610	406	254	53.98
4.763	457	178	305	53.98	457	254	203	53.98	610	254	254	53.98	610	406	254	53.98
5.556	457	178	305	53.98	457	254	203	53.98	610	254	254	53.98	813	508	406	79.38
6.350	457	254	254	53.98	610	254	254	53.98	813	457	406	53.98	914	560	457	79.38
7.938	457	254	254	53.98	610	254	254	53.98	813	457	406	53.98	914	560	457	79.38
8.731	457	254	203	53.98	813	406	406	53.98	813	508	406	79.38	1,270	406	660	79.38
9.525	457	254	203	53.98	813	406	406	53.98	813	508	406	79.38	1,270	406	660	79.38

In making racks for the above reels allow a 4-inch or 102-millimeter greater width than the traverse specified above.

Workmanship and Finish.—4. Each length of cable is to be evenly laid and free from kinks, loose wires, or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests.—*Tensile Test.*—5. (*a*) A tensile test shall be made upon each individual reel of cable purchased of a size.

(*b*) Samples of cable for testing for tensile strength shall be no less than 24 inches (610 mm.) in length. In making tensile tests the distance between jaws of testing machine with sample in place and before test shall be not less than 10 inches (254 mm.).

(*c*) Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing, but in case of failure or dispute on individual tests, and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

(*d*) Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test.—(*e*) One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test.—(*f*) A torsion test is to be made on one wire from each sample of cable taken for tensile test. The wire is to be gripped by two vises 8 inches (203 mm.) apart; one vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

(*g*) The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}} = \frac{55.9}{\text{diameter in millimeters}}.$$

(*h*) Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specification, the cable shall be accepted in this respect.

Dimensions and Tolerances.—6. There shall be no permissible variation in diameter below size. Cable having a diameter of 0.125 (⅛) to 0.187 (3/16) inch (3.18 to 4.76 mm.), inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 0.218 (7/32) to 0.375 (⅜) inch (5.56 to 9.53 mm.), inclusive, shall have a permissible variation of 7 per cent above size.

Delivery, Packing, and Shipping.—7. (*a*) All cable shall be shipped on reels in lengths as specified on orders.

(*b*) The dimensions of reels for different lengths and sizes of cable shall conform to the table attached to this specification.

(*c*) A tinned or galvanized steel seal wire of approved design shall pass around no less than 3 convolutions of the cable on the reel and shall pass through a linen tag showing the name of the manufacturer, the size and length of cable on the reel, the order number or other distinguishing marks, and a record of the test for tensile strength. A lead seal impressed with the official stamp of the representative of the Government making the inspection shall secure the ends of this seal wire and furnish evidence of inspection and acceptance.

(*d*) The outer layers of cable on a reel ready for shipment shall be protected from mechanical injury in handling and transportation by an efficient covering of burlap.

Chemical composition of standard carbon steels.

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1065	0.60–0.70	0.50–0.70	0.040	0.045
1070	.65– .75	.50– .70	.040	.045
1080	.75– .90	.25– .50	.040	.045

Table of weights, sizes, and strength of cable.

English Units.			Metric Units.		
Diameter, inches.	Minimum breaking strength, pounds.	Approximate weight, pounds per 100 feet.	Diameter, millimeters.	Minimum breaking strength, kilograms.	Approximate weight, kilograms per 100 meters.
0.375 (⅜)	14,400	26.45	9.525	6,532	39.36
.344 (11/32)	12,500	22.53	8.731	5,670	33.53
.312 (5/16)	9,800	17.71	7.938	4,445	26.35
.281 (9/32)	8,000	14.56	7.144	3,629	21.67
.250 (¼)	7,000	12.00	6.350	3,175	17.86
.218 (7/32)	5,600	9.50	5.556	2,540	14.14
.187 (3/16)	4,200	6.47	4.763	1,905	9.63
.156 (5/32)	2,800	4.44	3.969	1,270	6.61
.125 (⅛)	2,000	2.88	3.175	907	4.29

Specifications For Alloy Steel Bars and Billets For Case Hardening (130,000 Pounds Per Square Inch Tensile Strength)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The material for these bars shall be chosen from among the I. A. S. B. standard alloy steels listed below. The composition chosen shall be stated by the manufacturer or contractor; it is further limited as follows: Carbon, not over 0.25 per cent.

Manufacture.—3. (*a*) The steel shall be manufactured or at least finished by the open-hearth, electric furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) The billets from which the bars are made are to be rough turned or chipped to remove all surface defects which might produce seams in the finished bar. No undercutting in chipping will be allowed.

(*d*) The steel manufacturer shall state the heat treatment recommended for case hardening this steel and to give the physical properties specified.

Workmanship and Finish.—4. (*a*) The bars are to be sound, commercially straight, free from pipes, laps, cracks, twists, seams, and damaged ends, and are to have a workmanlike finish. They are to be uniform in quality, within the stipulated margins of manufacture, capable of being turned and threaded readily and of taking a good finish.

(*b*) Any article may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously been accepted by the inspector; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

Physical Properties and Tests.—5. The bars shall have the following physical properties:

Tensile Test.—(*a*) Minimum tensile strength, 130,000 pounds per square inch (91.39 kg./mm.²); minimum yield point, 120,000 pounds per square inch (84.36 kg./mm.²); minimum elongation in 2 inches (50.8 mm.) or proportional gage length, 18 per cent.

Hardness Test.—(*b*) After carbonizing, hardening, and tempering, the case must show a minimum Shore scleroscope hardness number of 75.

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture of the core in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat-treatment) of the material.

Selection of Test Specimens.—6. Three bars of each size rolled from a heat shall be taken and test pieces prepared in accordance with the I. A. S. B. standards. Each test piece and the bar from which it is cut shall be stamped with an identifying number. Should any of the test pieces, after being heat treated in the manner recommended by the steel manufacturers, fail to show the prescribed physical properties, new test pieces similarly identified shall be made from the same three bars. At the option of the purchaser, the steel manufacturer may recommend a different heat treatment for the second set of test specimens, and to that end he may make such tests as he desires from the remainder of the three bars taken for the tests. Should any of the three specimens taken for the final tests fail to show the required physical properties, the bars of that heat of the size represented by the specimens shall be rejected.

Dimensions and Tolerances.—7. The dimensions and tolerances shall be those of the specifications 3S11.

Delivery, Packing, and Shipping.—8. (*a*) The bars shall be delivered in the annealed state.

(*b*) The bars shall in general be grouped in bundles weighing not more than 250 pounds (113.4 kg.), unless otherwise agreed between manufacturer and purchaser; the heat number and the I. A. S. B. steel serial numbers shall be plainly marked on a metal tag attached to each bundle. If bars are not so grouped and bundled, each bar shall be plainly marked with the heat number and the I. A. S. B. steel serial number.

Chemical composition of standard alloy steels

NICKEL STEELS

Number.	Carbon.	Manganese	Phosphorus, maximum.	Sulphur, maximum.	Nickel.	Chromium.
2315....	0. 10-0. 20	0. 30-0. 60	0. 040	0. 045	3. 25-3. 75	.....
2320....	. 15- . 25	. 30- . 60	. 040	. 045	3. 25-3. 75	.....

NICKEL-CHROMIUM STEELS

3120...	0. 15-0. 25	0. 30-0. 60	0. 040	0. 045	1. 00-1. 50	0. 45-0. 75
3215...	. 10- . 20	. 30- . 60	. 040	. 045	1. 50-2. 00	. 90-1. 25
X3315..	. 10- . 20	. 30- . 60	. 040	. 045	2. 75-3. 25	. 70- . 95
3315...	. 10- . 20	30- . 60	. 040	. 045	3. 25-3. 75	1. 25-1. 75

CHROMIUM VANADIUM STEELS

Number.	Carbon.	Manganese	Phosphorus, maximum.	Sulphur, maximum.	Chromium.	Vanadium, minimum.
6120	0. 15-0. 25	0. 30-0. 60	0. 040	0. 045	0. 60-0. 90	0. 15

When electric or crucible furnace steel is specified, the maximum allowable percentages of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

Specifications For Extra Soft Carbon Steel Sheet

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The material for these sheets shall be chosen from the I. A. S. B. standard steels listed below. The composition shall be stated by the manufacturer or contractor, and is further limited as follows: Carbon, not over 0.15 per cent.

Manufacture.—3. (*a*) The steel shall be manufactured, or at least finished, by the open-hearth, electric-furnace or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) Sheets, unless ordered cold rolled, shall be full pickled.

Heat Treatment.—(*d*) Sheets are to be well and uniformly annealed in accordance with good commercial practice. For sheets lighter than 0.065 inch (1.65 mm.), box annealing is preferred. For sheets 0.065 inch (1.65 mm.) and thicker, open annealing is preferred.

Workmanship and Finish.—4. (*a*) The sheets must be commercially flat, clean, smooth, free from seams, laminations, blisters, and other surface defects. They must be uniform in quality, and within the stipulated margins of manufacture.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously been

accepted by the inspector; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) Specimens cut in any direction from the sheets shall have the following properties:

Tensile Test.—(*b*) Minimum tensile strength, 50,000 pounds per square inch (35.2 kg./mm.²); minimum yield point, 30,000 pounds per square inch (21.09 kg./mm.²); minimum elongation 25 per cent in 4 inches (101.6 mm.).

Bend Test.—(*c*) Strips cut from sheets shall stand being bent through an angle of 180 degress in any direction to a radius equal to the thickness of the sheet without fracture.

(*d*) Strips 1¼ inches (31.75 mm.) wide cut from sheets and with edges rounded shall stand reverse bending, cold, through an angle of 90 degrees for not less than three complete reversals, without fracture. The test is to be made in a square-nose vise, the edges over which the specimen is bent being rounded to a radius equal to three times the thickness of the sheet.

SELECTION OF TEST SPECIMENS.—6. Three sheets shall be taken from each annealing box to represent the top, middle, and bottom of the stack, or 1 sheet from each 25 when sheets are open annealed. One tensile, one bend, and one reverse bending test shall be made from each sheet selected.

DIMENSIONS AND TOLERANCES.—7. The dimensions and tolerances shall be those given in the table below and in the specifications 3S11. The thickness will be specified in decimals of an inch or millimeters.

DELIVERY, PACKING, AND SHIPPING.—8. (*a*) Sheets shall be cut to the required dimensions and shall be ordered in as narrow widths as can be used.

(*b*) All sheets shall be oiled for protection against corrosion.

(*c*) Sheets 0.065 inch (1.65 mm.) or thinner shall be boxed, the weight of box with contents not to exceed 220 pounds (100 kg.).

(*d*) Sheets thicker than 0.065 inch (1.65 mm.) up to and including 0.125 inch (3.18 mm.), shall be created, the weight of crate and contents not to exceed 220 pounds (100 kg.).

(*e*) Sheets thicker than 0.125 inch (3.18 mm.) may be bundled, the weight of bundle not to exceed 220 pounds (100 kg.).

Compositions of Standard steels

Number.	Carbon.	Manganese	Phosphorus, maximum.	Sulphur, maximum.
1010	0. 05-0. 15	0. 30-0.60	0. 045	0. 050

When electric or crucible steel is specified in the order, the maximum allowable percentage of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

Table of tolerances for standard steel sheets

Thickness.		Tolerance for sheets 14 inches (35.6 cm.) wide and under.		Tolerance for sheets over 14 inches (35.6 cm.) wide.	
Inches.	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
0–0. 020	0. 51	+0. 001 — . 002	+0. 03 — . 05	±0. 002	±0. 05
0. 021– . 030	0. 54– . 76	+ . 002 — . 003	+ . 05 — . 08	± . 003	± . 08
.031 .040	. 79–1. 02	± . 003	± . 08	± . 003	± . 08
. 041– . 050	1. 05–1. 27	± . 003	— .08	± . 004	± . 10
. 051– . 065	1. 30–1. 65	± . 004	± . 10	± . 004	± . 10
. 066– . 080	1. 68–2. 03	± . 004	± . 10	± . 005	± . 13
. 081– . 100	2. 06–2. 54	± . 006	± . 15	± . 006	± . 15
. 101– . 120	2. 57–3. 05	± . 006	± . 15	± . 007	± . 18
.121. .250	3. 08–6. 35	± . 006	± . 15	± . 008	± . 20

Specifications For Soft Carbon Steel Sheet

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The material for these sheets shall be chosen from the I. A. S. B. standard steels listed below. The composition shall be stated by the manufacturer or contractor, and is further limited as follows: Carbon, not over 0.30 per cent; manganese may be from 0.30 to 0.60 per cent.

MANUFACTURE.—3. (*a*) The steel shall be manufactured, or at least finished, by the open-hearth, electric-furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) Sheets, unless ordered cold rolled, shall be full pickled.

Heat Treatment.—(*d*) Sheets are to be well and uniformly annealed, in accordance with good commercial practice. For sheets lighter than 0.065 inch (1.65 mm.), box annealing is preferred. For sheets 0.065 inch (1.65 mm.) and thicker, open annealing is preferred.

WORKMANSHIP AND FINISH.—4. (*a*) The sheets must be commercially flat, clean, smooth, free from seams, laminations, blisters, and other surface defects. They must be uniform in quality, and within the stipulated margins of manufacture.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously been accepted by the inspector; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5(*a*) Specimens cut in any direction from the sheets shall have the following properties:

Tensile Test.—(*b*) Minimum tensile strength, 60,000 pounds per square inch (42.18 kg. mm.²); minimum yield point, 36,000 pounds per square inch (25.31 kg mm.²); minimum elongation, 22 per cent in 4 inches (101.6 mm.).

Bend Tests.—(*c*) Strips cut from sheets shall stand being bent cold through an angle of 180 degrees in any direction to a radius equal to the thickness of the sheet without fracture.

(*d*) Strips 1¼ inches (31.75 mm.) wide cut from sheets and with edges rounded shall stand reverse bending, cold, through an angle of 90 degress for not less than three complete reversals without fracture. The test is to be made in a square-nose vise, the edges over which the specimen is bent being rounded to a radius equal to three times the thickness of the sheet.

SELECTION OF TEST SPECIMENS.—6. Three sheets shall be taken from each annealing box to represent the top, middle, and bottom of the stack, or one sheet from each 25, when sheets are open annealed. One tensile, one bend, and one reverse bending test shall be made from each sheet selected.

DIMENSIONS AND TOLERANCES.—7. (*a*) The dimensions and tolerances shall be those given in the table below and in the specifications 3S11. The thickness will be specified in decimals of an inch or millimeters.

DELIVERY, PACKING, AND SHIPPING.—8. (*a*) Sheets shall be cut to the required dimensions and shall be ordered in as narrow widths as can be used.

(*b*) All sheets shall be oiled for protection against corrosion.

(*c*) Sheets 0.065 inch (1.65 mm.) or thinner shall be boxed, the weight of box with contents not to exceed 220 pounds (100 kg.).

(*d*) Sheets thicker than 0.065 inch (1.65 mm.), up to and including 0.125 inch (3.18 mm.), shall be crated, the weight of crate and contents not to exceed 220 pounds (100 kg.).

(*e*) Sheets thicker than 0.125 inch (3.18 mm.) may be bundled, the weight of bundle not to exceed 220 pounds (100 kg.).

Compositions of Standard steels

Number.	Carbon.	Manganese	Phosphorus maximum.	Sulphur, maximum.
1020.....	0. 15–0. 25	0. 30–0. 60	0. 045	0. 050
1025.....	. 20– . 30	. 50– . 80	. 045	. 050

When electric or crucible furnace steel is specified in the order, the maximum allowable percentage of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

Table of tolerances for standard steel sheets

Thickness.		Tolerance for sheets 14 inches (35.6 cm.) wide and under.		Tolerance for sheets over 14 inches (35.6 cm.) wide.	
Inches.	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
0–0. 020	0. 51	+0. 001 — . 002	+0. 03 — . 05	±0. 002	±0. 05
0. 021– . 030	0. 54– . 76	+ .002 — . 003	+ . 05 — . 08	± . 003	± . 08
. 031– . 040	. 79–1. 02	± .003	± . 08	± . 003	± . 08
. 041– . 050	1. 05–1. 27	± . 003	± . 08	± . 004	± . 10
. 051– . 065	1. 30–1. 65	± . 004	± . 10	± . 004	± . 10
. 066– . 080	1. 68–2. 03	± . 004	± . 10	± . 005	± . 13
. 081– . 100	2. 06–2. 54	± . 006	± . 15	± . 006	± . 15
. 101– . 120	2. 57–3. 05	± . 006	± . 15	± . 007	± . 18
. 121– . 250	3. 08–6. 35	± . 006	± . 15	± . 008	± . 20

Specifications For One-Half Hard Carbon Steel Sheet

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The material for these sheets shall be chosen from the I. A. S. B. standard steels listed below. The composition shall be stated by the manufacturer or contractor, and is further limited as follows: Carbon, not over 0.40 per cent; manganese may be from 0.30 to 0.60 per cent.

MANUFACTURE.—3. (*a*) The steel shall be manufactured, or at least finished, by the open-hearth, electric-furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) Sheets, unless ordered cold rolled, shall be full pickled.

Heat Treatment.—(*d*) Sheets are to be well and uniformly annealed, in accordance with good commercial practice. For sheets lighter than 0.065 inch (1.65 mm.), box annealing is preferred. For sheets 0.065 inch (1.65 mm.) and thicker, open annealing is preferred.

WORKMANSHIP AND FINISH.—4. (*a*) The sheets must be commercially flat, clean, smooth, free from seams, laminations, blisters, and other surface defects. They must be uniform in quality, and within the stipulated margins of manufacture.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously been accepted by the inspector; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) Specimens cut in any direction from the sheets shall have the following properties:

Tensile Test.—(*b*) Minimum tensile strength, 75,000 pounds per square inch (52.73 kg./mm.²); minimum yield point, 45,000 pounds per square inch (31.64 kg./mm.²); minimum elongation, 18 per cent in 4 inches (101.6 mm.).

Bend Test.—(*c*) Strips cut from sheets shall stand being bent cold through an angle of 180 degrees in any direction to a radius equal to the thickness of the sheet without fracture.

(*d*) Strips 1¼ inches (31.75 mm.) wide cut from sheets and with edges rounded shall stand reverse bending, cold, through an angle of 90 degrees for not less than three complete reversals, without fracture. The test is to be made in a square-nose vise, the edges over which the specimen is bent being rounded to a radius equal to three times the thickness of the sheet.

SELECTION OF TEST SPECIMENS.—6. Three sheets shall be taken from each annealing box to represent the top, middle, and bottom of the stack, or 1 sheet from each 25 when sheets are open annealed. One tensile, one bend, and one reverse bending test shall be made from each sheet selected.

DIMENSIONS AND TOLERANCES.—7. The dimensions and tolerances shall be those given in the table below and in the specifications 3S11. The thickness will be specified in decimals of an inch or millimeters.

DELVIERY, PACKING, AND SHIPPING.—8. (*a*) Sheets shall be cut to the required dimensions and shall be ordered in as narrow widths as can be used.

(*b*) All sheets shall be oiled for protection against corrosion.

(*c*) Sheets 0.065 inch (1.65 mm.) or thinner, shall be boxed, the weight of box with contents not to exceed 220 pounds (100 kg.).

(*d*) Sheets thicker than 0.065 inch (1.65 mm.), up to and including 0.125 inch (3.18 mm.), shall be crated, the weight of crate and contents not to exceed 220 pounds (100 kg.).

(*e*) Sheets thicker than 0.125 inch (3.18 mm.), may be bundled, the weight of bundle not to exceed 220 pounds (100 kg.).

Chemical compositions of standard steels

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1030	0. 25–0. 35	0. 50–0. 80	0. 045	0. 050
1035	. 30– . 40	. 50– . 80	. 045	. 050

When electric or crucible steel is specified in the order, the maximum allowable percentage of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

Table of tolerances for standard steel sheets

Thickness.		Tolerance for sheets 14 inches (35.6 cm.) wide and under.		Tolerance for sheets over 14 inches (35.6 cm.) wide.	
Inches.	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
0–0. 020	0–0. 51	+0. 001 — . 002	+0. 03 — . 05	±0. 002	±0. 05
0. 021– . 030	0. 54– . 76	+ . 002 — . 003	+ . 05 — . 08	± . 003	± . 08
. 031– . 040	. 79–1. 02	± . 003	± . 08	± . 003	± . 08
. 041– . 050	1. 05–1. 27	± . 003	± . 08	± . 004	± . 10
. 051– . 065	1. 30–1. 65	± . 004	± . 10	± . 004	± . 10
. 066– . 080	1. 68–2. 03	± . 004	± . 10	± . 005	± . 13
. 081– . 100	2 06–2. 54	± . 006	± . 15	± . 006	± . 15
. 101– . 120	2. 57–3. 05	± . 006	± . 15	± . 007	± . 18
. 121– . 250	3. 08–6. 35	± . 006	± . 15	± . 008	± . 20

Specifications for Alloy Steel Sheet

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The material for these sheets shall be chosen from the I. A. S. B. standard alloy steels listed below. The composition shall be stated by the manufacturer or contractor, and is further limited as follows: Carbon, not over 0.25 per cent.

Manufacture.—3. (*a*) The steel shall be manufactured, or at least finished, by the open hearth, electric-furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) Sheets, unless ordered cold-rolled, shall be full pickled.

(*d*) Sheets are to be well and uniformly annealed in accordance with good commercial practice. For sheets lighter than 0.065 inch (1.65 mm.), box annealed is preferred. For sheets 0.065 inch (1.65 mm.) and thicker, open annealing is preferred.

Heat Treatment.—(*e*) The manufacturer shall state the heat treatment recommended to give the physical properties specified.

Workmanship and Finish.—4. (*a*) The sheets must be commercially flat, clean, smooth, free from seams, laminations, blisters, and other surface defects. They must be uniform in quality, and within the stipulated margins of manufacture.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously been accepted by the inspector; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

Physical Properties and Tests.—5. (*a*) Specimens cut in any direction from the heat-treated sheets shall have the following properties:

Tensile Test.—(*b*) Minimum tensile strength, 100,000 pounds per square inch (70.30 kg./mm.^{2}); minimum yield point, 75,000 pounds per square inch (52.73 kg./mm.^{2}); minimum elongation, 15 per cent in 4 inches (101.6 mm.).

Bend Test.—(*c*) Strips cut from annealed sheets shall stand being bent cold through an angle of 180 degrees, in any direction, to a radius equal to the thickness of the sheet without fracture.

(*d*) Strips 1¼ inches (31.75 mm.) wide cut from annealed sheets, and with edges rounded, shall stand reversed bending, cold, through an angle of 90 degrees for not less than three complete reversals, without fracture. The test is to be made in a square-nose vise, the edges over which the specimen is bent being rounded to a radius equal to three times the thickness of the sheet.

Selection of Test Specimens.— 6. Three sheets shall be taken from each annealing box to represent the top, middle, and bottom of the stack, or 1 sheet from each 25 when sheets are open annealed. One tensile, one bending, and one reverse bending test shall be made from each sheet selected.

Dimensions and Tolerances.—7. The dimensions and tolerances shall be those given in the table below and in the specifications 3S11. The thickness will be specified in decimals of an inch or millimeters.

Delivery, Packing, and Shipping.—8. (*a*) Sheets shall be cut to the required dimensions and shall be ordered in as narrow widths as can be used.

(*b*) All sheets shall be oiled for protection against corrosion.

(*c*) Sheets 0.065 inch (1.65 mm.) or thinner shall be boxed, the weight of box with contents not to exceed 220 pounds (100 kg.).

(*d*) Sheets thicker than 0.065 inch (1.65 mm.), up to and including 0.125 inch (3.18 mm.), shall be crated, the weight of crate and contents not to exceed 220 pounds (100 kg.).

(*e*) Sheets thicker than 0.125 inch (3.18 mm.) may be bundled, the weight of bundle not to exceed 220 pounds (100 kg.).

Chemical composition of standard alloy steels.

NICKEL STEELS.

Number.	Carbon.	Manganese	Phosphorus, maximum.	Sulphur, maximum.	Nickel.	Chromium.
2315.....	0.10-0.20	0.30-0.60	0.040	0.045	3.25-3.75	.....
2320.....	.15- .25	.30- .60	.040	.045	3.25-3.75	....
2325.....	.20- .30	.30- .60	.040	.045	3.25-3.75	.....

NICKEL-CHROMIUM STEEL.

3120.....	0.15-0.25	0.30-0.60	0.040	0.045	1.00-1.50	0.45-0.75
3215.....	.10- .20	.30- .60	.040	.045	1.50-2.00	.90-1.25
X3315.....	.10- .20	.50- .80	.040	.045	2.75-3.25	.70- .95
3315.....	.10- .20	.30- .60	.040	.045	3.25-3.75	1.25-1.75

CHROMIUM-VANADIUM STEELS.

Number.	Carbon.	Manganese	Phosphorus, maximum.	Sulphur, maximum.	Chromium.	Vanadium minimum.
6120.....	0.15-0.25	0.30-0.60	0.040	0.045	0.60-0.90	0.15

When electric or crucible furnace steel is specified in the order, the maximum allowable percentages of phosphorus and sulphur may, at the option of the purchaser, be limited to 9.03 per cent.

Table of tolerances for standard steel sheets.

Thickness.		Tolerance for sheets 14 inches (35.6 cm.) wide and under.		Tolerance for sheets over 14 inches (35.6 cm.) wide.	
Inches.	*Millimeters.*	*Inches.*	*Millimeters.*	*Inches.*	*Millimeters.*
0-0.030	0-0.51	+0.001 — .002	+0.03 — .05	±0.002	±0.05
0.021- .030	0.54- .76	+ .002 — .003	+ .05 — .08	± .003	± .08
.031- .040	.79-1.02	± .003	± .08	± .003	± .08
.041- .050	1.05-1.27	± .003	± .08	± .004	± .10
.051- .065	1.30-1.65	± .004	± .10	± .004	± .10
.066- .080	1.68-2.03	± .004	± .10	± .005	± .13
.081- .100	2.06-2.54	± .006	± .15	± .006	± .15
.101- .120	2.57-3.05	± .006	± .15	± .007	± .18
.121- .250	3.08-6.35	± .006	± .15	± .008	± .20

Specifications for Turnbuckles

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. Barrels shall be made of naval brass or equivalent alloy, I. A. S. B. specifications 3N4. The shanks shall be made of steel, I. A. S. B. specifications 3S4.

Physical Properties and Tests.—3. (*a*) At least 2 per cent of all turnbuckles shall be subjected to the test load given in the table and must withstand this test.

Steel turnbuckle shanks shall be heat treated to withstand the test loads specified.

(*b*) A bend test shall be made upon a (unbroken) shank of each turnbuckle tested in tension; the shank must withstand bending through 90 degrees without cracking.

Dimensions and Tolerances.—4. Dimensions and tolerances are given in the tables following.

Assembly.—5. The threads are to be greased and must have a snug true fit allowing the barrel or shank to be turned by hand and showing absolutely no slackness in fit or perceptible end shake when the ends have been extended three threads from the barrel.

Finish.—6. Turnbuckle shanks shall be thoroughly covered with a suitable noncorrosive grease before shipment. Before inspection of the finished turnbuckles they may, if so specified, be copper plated in order that initial stress in the barrel may be detected. After this inspection turnbuckles shall be greased or shall be coated with an air-drying enamel as specified.

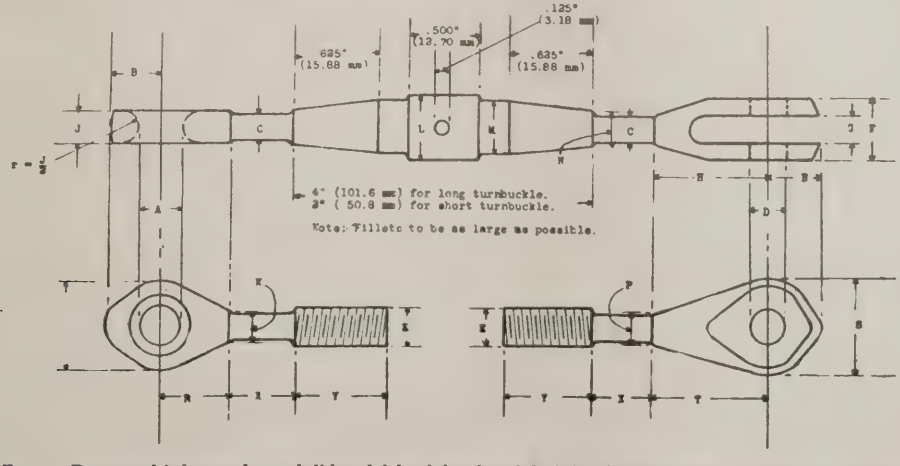


Fig 1.—*For eye and fork type, the eye shall have left hand threads and the fork right hand threads, for double eye type, one end shall have left hand threads and the other right hand threads.*

DIMENSIONS IN INCHES.

I. A. S. B. No.	Strength in pounds.	Eye end.										Fork end.								Barrel.			Threads per inch, U. S. standard.
		C +0.001 −0.002	E	X +0.005 −0.005	Y +0.040 −0.000	A +0.002 −0.000	B +0.005 −0.005	J +0.005 −0.002	K +0.005 −0.005	R +0.005 −0.005	W +0.005 −0.005	B +0.005 −0.005	D +0.002 −0.000	F +0.015 −0.000	G +0.015 −0.000	H +0.005 −0.005	P +0.005 −0.005	S +0.005 −0.005	T +0.005 −0.005	L +0.005 −0.005	M +0.005 −0.005	N +0.005 −0.005	
1 A	1,500	0.130	0.203	0.500	0.500	0.219	0.250	0.188	0.219	0.281	0.500	0.275	0.156	0.313	0.110	0.300	0.219	0.500	0.560	0.375	0.281	0.208	30
1 B	1,500	.130	.203	1.531	.500	.219	.250	.188	.219	.281	.500	.275	.156	.313	.110	.300	.219	.500	.560	.375	.281	.208	30
1 C	1,500	.130	.203	.500	.500	.219	.250	.188	.219	.281	.500									.375	.281	.208	30
1 D	1,500	.130	.203	1.531	.500	.219	.250	.188	.219	.281	.500									.375	.281	.208	30
2 A	2,150	.157	.203	.500	.563	.219	.328	.188	.219	.313	.500	.328	.188	.313	.110	.438	.219	.500	.625	.375	.328	.281	30
2 B	2,150	.157	.203	1.531	.563	.219	.328	.188	.219	.313	.500	.328	.188	.313	.110	.500	.219	.500	.667	.375	.328	.281	30
2 C	2,150	.157	.203	.500	.563	.219	.328	.188	.219	.313	.500	a .328	a .188							.375	.328	.281	30
2 D	2,150	.157	.203	1.531	.563	.219	.328	.188	.219	.313	.500									.375	.328	.281	30
3 A	3,000	.185	.234	.500	.625	.281	.391	.219	.250	.375	.625	.391	.250	.344	.110	.625	.250	.625	.813	.453	.391	.313	28
3 B	3,000	.185	.234	1.375	.625	.281	.391	.219	.250	.406	.625	.391	.250	.344	.110	.625	.250	.625	.813	.453	.391	.313	28
3 C	3,000	.185	.234	.500	.625	.281	.391	.219	.250	.375	.625	a .391	a .250							.453	.391	.313	28
3 D	3,000	.185	.234	1.375	.625	.281	.391	.219	.250	.406	.625									.453	.391	.313	28
4 A	4,000	.213	.265	.500	.688	.344	.422	.250	.281	.500	.688	.422	.250	.438	.203	.625	.281	.688	.875	.500	.438	.375	26
4 B	4,000	.213	.265	1.250	.688	.344	.422	.250	.281	.500	.688	.422	.250	.438	.203	.625	.281	.688	.875	.500	.438	375	26
4 C	4,000	.213	.265	.500	.688	.344	.422	.250	.281	.500	.688									.500	.438	375	26
4 D	4,000	.213	.265	1.250	.688	.344	.422	.250	.281	.500	.688									.500	.438	.375	26
5 A	5,750	.256	.313	.500	.750	.313	.469	.281	.313	.563	.750	.469	.281	.563	.203	.625	.313	.750	.875	.531	.484	.438	24
5 B	5,750	.256	.313	1.250	.750	.313	.469	.281	.313	.563	.750	.469	.281	.563	.203	.625	.313	.750	.875	.531	.484	.438	24
5 C	5,750	.256	.313	.500	.750	.313	.469	.281	.313	.563	.750									.531	.484	.438	24
5 D	5,750	.256	.313	1.250	.750	.313	.469	.281	.313	.563	.750									.531	.484	.438	24
6 A	8,400	.318	.375	.500	.875	.313	.500	.328	.375	.625	.875	.500	.313	.563	.266	.563	.375	.875	.875	.625	.594	.469	22
6 B	8,400	.318	.375	1.125	.875	.313	.500	.328	.375	.625	.875	.500	.313	.563	.266	.563	.375	.875	.875	.625	.594	.469	22
6 C	8,400	.318	.375	.500	.875	b .313	.500	.328	.375	.625	.875									.625	.594	.469	22
6 D	8,400	.318	.375	1.125	.875	.313	.500	.328	.375	.625	.875									.625	.594	.469	22

a When a turnbuckle has two eye ends with different size holes for the pin and cable, the two diameters are given.
b This turnbuckle is to be bored to receive pin on one end only.

DIMENSIONS IN MILLIMETERS.

I. A. S. B No.	Strength in kilograms.	Eye end.										Fork end.								Barrel.			Threads per inch, U. S. standard.
		C +0.03 − .05	E	X +0.13 − .13	Y +1.02 − .00	A +0.05 − .00	B +0.13 − .13	J +0.13 − .05	K +0.13 − .13	R +0.13 − .13	W +0.13 − .13	B +0.13 − .13	D +0.05 − .00	F +0.38 − .00	G +0.38 − .00	H +0.13 − .13	P +0.13 − .13	S +0.13 − .13	T +0.13 − .13	L +0.13 − .13	M +0.13 − .13	N +0.13 − .13	
1 A	680.4	3.30	5.16	12.70	12.70	5.56	6.35	4.76	5.56	7.14	12.70	6.99	3.97	7.94	2.79	7.62	5.56	12.70	14.22	9.53	7.14	5.28	30
1 B	680.4	3.30	5.16	38.89	12.70	5.56	6.35	4.76	5.56	7.14	12.70	6.99	3.97	7.94	2.79	7.62	5.56	12.70	14.22	9.53	7.14	5.28	30
1 C	680.4	3.30	5.16	12.70	12.70	5.56	6.35	4.76	5.56	7.14	12.70									9.53	7.14	5.28	30
1 D	680.4	3.30	5.16	38.89	12.70	5.56	6.35	4.76	5.56	7.14	12.70									9.53	7.14	5.28	30
2 A	975.2	3.99	5.16	12.70	14.29	5.56	8.33	4.76	5.56	7.94	12.70	8.33	4.76	7.94	2.79	11.11	5.56	12.70	15.88	9.53	8.33	7.14	30
2 B	975.2	3.99	5.16	38.89	14.29	5.56	8.33	4.76	5.56	7.94	12.70	8.33	4.76	7.94	2.79	12.70	5.56	12.70	17.46	9.53	8.33	7.14	30
2 C	975.2	3.99	5.16	12.70	14.29	5.56	8.33	4.76	5.56	7.94	12.70	a 8.33	a 4.76							9.53	8.33	7.14	30
2 D	975.2	3.99	5.16	38.89	14.29	5.56	8.33	4.76	5.56	7.94	12.70									9.53	8.33	7.14	30
3 A	1,361	4.70	5.95	12.70	15.88	7.14	9.92	5.56	6.35	9.53	15.88	9.92	6.35	8.73	2.79	15.88	6.35	15.88	20.64	11.51	9.92	7.94	28
3 B	1,361	4.70	5.95	34.93	15.88	7.14	9.92	5.56	6.35	10.32	15.88	9.92	6.35	8.73	2.79	15.88	6.35	15.88	20.64	11.51	9.92	7.94	28
3 C	1,361	4.70	5.95	12.70	15.88	7.14	9.92	5.56	6.35	9.53	15.88	a 9.92	a 6.35							11.51	9.92	7.94	28
3 D	1,361	4.70	5.95	34.93	15.88	7.14	9.92	5.56	6.35	10.32	15.88									11.51	9.92	7.94	28
4 A	1,814	5.41	6.73	12.70	17.46	8.73	10.72	6.35	7.14	12.70	17.46	10.72	6.35	11.11	5.16	15.88	7.14	17.46	22.23	12.70	11.11	9.53	26
4 B	1,814	5.41	6.73	31.75	17.46	8.73	10.72	6.35	7.14	12.70	17.46	10.72	6.35	11.11	5.16	15.88	7.14	17.46	22.23	12.70	11.11	9.53	26
4 C	1,814	5.41	6.73	12.70	17.46	8.73	10.72	6.35	7.14	12.70	17.46									12.70	11.11	9.53	26
4 D	1,814	5.41	6.73	31.75	17.46	8.73	10.72	6.35	7.14	12.70	17.46									12.70	11.11	9.53	26
5 A	2,608	6.50	7.94	12.70	19.05	7.94	11.91	7.14	7.94	14.29	19.05	11.91	7.14	14.29	5.16	15.88	7.94	19.05	22.23	13.49	12.30	11.11	24
5 B	2,608	6.50	7.94	31.75	19.05	7.94	11.91	7.14	7.94	14.29	19.05	11.91	7.14	14.29	5.16	15.88	7.94	19.05	22.23	13.49	12.30	11.11	24
5 C	2,608	6.50	7.94	12.70	19.05	7.94	11.91	7.14	7.94	14.29	19.05									13.49	12.30	11.11	24
5 D	2,608	6.50	7.94	31.75	19.05	7.94	11.91	7.14	7.94	14.29	19.05									13.49	12.30	11.11	24
6 A	3,810	8.08	9.53	12.70	22.23	7.94	12.70	8.33	9.53	15.88	22.23	12.70	7.94	14.29	6.75	14.29	9.53	22.23	22.23	15.88	15.08	11.91	22
6 B	3,810	8.08	9.53	28.58	22.23	7.94	12.70	8.33	9.53	15.88	22.23	12.70	7.94	14.29	6.75	14.29	9.53	22.23	22.23	15.88	15.08	11.91	22
6 C	3,810	8.08	9.53	12.70	22.23	b 7.94	12.70	8.33	9.53	15.88	22.23									15.88	15.08	11.91	22
6 D	3,810	8.08	9.53	28.58	22.23	7.94	12.70	8.33	9.53	15.88	22.23									15.88	15.08	11.91	22

a When a turnbuckle has two eye ends with different size holes for the pin and cable, the two diameters are given.
b This turnbuckle is to be bored to receive pin on one end only.

NOTE.—In column marked "I. A. S. B. No." the letters used are for the following items: A, short fork and eye turnbuckle; B, long fork and eye turnbuckle; C, short double-eye turnbuckle; D, long double-eye turnbuckle.

SPECIFICATIONS FOR AIRCRAFT FERULES AND THIMBLES

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. Thimbles shall be manufactured of I. A. S. B. standard No. 1010 steel sheet, cold rolled and annealed. Ferrules shall be manufactured of the same steel as is used for the wire namely, I. A. S. B. standard steels No. 1065, No. 1070, or No. 1080.

MANUFACTURE.—3 (a) Steel wire for winding into ferrules shall be uniformly coated with pure tin to solder readily.

(b) All thimbles shall be smoothly and evenly electro galvanized.

DIMENSIONS AND TOLERANCES.—4. (a) Ferrules and thimbles shall conform within limits specified to the dimensions given in the tables and drawings.

(b) The manufacturer shall provide hardened pin gages for all sizes of thimbles and ferrules and such gages, after being approved by the Government, shall be used by the inspectors for determining all internal dimensions and shapes.

DELIVERY, PACKING, AND SHIPPING.—5. (a) Ferrules and thimbles shall be packed and shipped in fiber or pasteboard boxes containing 1,000 each.

(b) A label on each box shall be marked with order number or other distinguishing marks, size, material, evidence of inspection, etc., as required.

INSPECTION AND REJECTION.—6. The inspector shall examine one sample taken at random from a box of 1,000 ferrules or thimbles and determine whether it conforms to these specifications.

I. A. S. B. standard tinned steel aircraft ferrules.

ENGLISH UNITS.

American Wire Gage (B. & S.).	A and B.	D.	E.	Approximate weight, 1,000 pieces.
	Inch.	*Inch.*	*Inch.*	*Pounds.*
8	0.128	0.130	0.260	34.50
9	.114	.116	.232	23.00
10	.102	.104	.208	17.00
11	.091	.093	.186	11.75
12	.081	.083	.166	8.50
13	.072	.074	.148	6.03
14	.064	.066	.132	4.50
15	.057	.059	.118	3.10
16	.051	.053	.106	2.09

METRIC UNITS.

American Wire Gage (B. & S.).	A and B.	D.	E.	Approximate weight, 1,000 pieces.
	mm.	*mm.*	*mm.*	*kg.*
8	3.25	3.30	6.60	15.65
9	2.91	2.96	5.92	10.43
10	2.59	2.64	5.28	7.71
11	2.31	2.36	4.72	5.33
12	2.05	2.10	4.20	3.86
13	1.83	1.88	3.76	2.74
14	1.63	1.68	3.36	2.04
15	1.45	1.50	3.00	1.41
16	1.29	1.34	2.68	.95

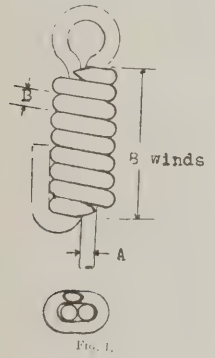


Fig. 1.

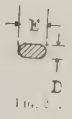


Fig. 2.

I. A. S. B. standard tinned steel aircraft ferrules.

ENGLISH UNITS.

Size.	A.	B.	C.	D.	E.	Approximate weight, 1,000 pieces.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Pounds.*
1/8 and 5/32	0.35	0.70	0.07	0.09	0.032	3.00
3/16	.35	.70	.07	.13	.032	4.34
7/32	.40	.80	.10	.17	.032	6.36
1/4	.50	1.00	.135	.21	.032	9.00
9/32	.60	1.20	.15	.24	.032	13.50
5/16	.70	1.40	.17	.25	.032	16.63
11/32	.80	1.60	.198	.30	.040	30.36
3/8	.90	1.80	.21	.33	.040	33.00
7/16	1.00	2.00	.26	.39	.060	74.00

METRIC UNITS.

mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*kg.*
1.59 and 2.38	8.89	17.78	1.78	2.29	0.81	1.36
3.18	8.89	17.78	1.78	3.30	.81	1.97
3.97	10.16	20.32	2.54	4.32	.81	2.88
4.76	12.70	25.40	3.43	5.33	.81	4.08
5.56	15.24	30.48	3.81	6.10	.81	6.12
6.35	17.78	35.56	4.32	6.35	.81	7.54
7.14	20.32	40.64	5.03	7.62	1.02	13.77
7.94	22.86	45.72	5.33	8.38	1.02	14.97
9.53	25.40	50.80	6.60	9.91	1.52	33.57

Tolerance on dimension A (see Fig. 3) shall be +0.01-inch (0.25 mm.).

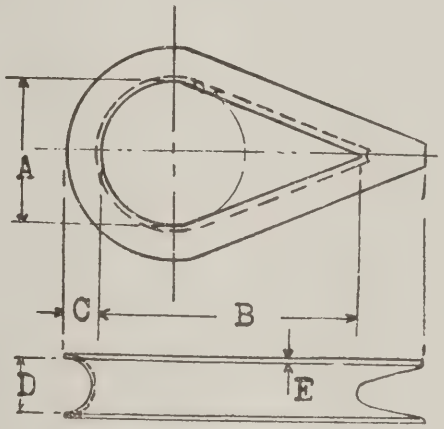


FIG. 3.

The S. V. A. Fighting Scout

(*Continued from page* 514)

teristics and a photograph of the SPA appeared in the November 19th issue of AERIAL AGE. The propeller is 2,750 m (about 9'-0") in diameter, with a 2,100 m (6'-11") pitch.

Gasoline is carried for an endurance of 3 hours, weighing 105 kg (231.48 lbs.) and oil weighing 15 kg (33.06 lbs.)

General

In the empty machine, the weights are distributed as follows: Machine unequipped, 300 kg. (661.38 lbs.); motor, propeller and radiator, 315 kg. (694.45 lbs.); fuel tanks and the necessary piping, 25 kg. (55.11 lbs.). Total weight 640 kg., or 1,410.95 lbs.

The useful load consists of oil and gasoline weighing 120 kg. (264.55 lbs.) and an additional useful weight of 140 kg. (308.65 lbs.). The loading of the machine per b. h. p. is equal to approximately 9 lbs.

This type of S.V.A. machine is also manufactured in what is called the "reduced size," in which the wing span is shortened to 7,570 mm (24'-10") but otherwise preserving the lines of the "Normal" type. In the smaller machine, the total weight of the machine is 875 kg (1,929.04 lbs.) instead of 900 kg, and the loading on the surface is 39.300 kg (87 lbs.) instead of 81 lbs. as in the "Normal" type. With the smaller machine, the same powered motor, and a change in the angle of incidence of the planes, a much greater speed is obtained.

To Put Aeroplanes in Use After War

Washington, D. C.—Application of aircraft to civil purposes will be undertaken by the National Advisory Committee for Aeronautics through a special committee on civil aerial transport. An announcement said the new committee would supersede the committee on aerial mail service and would have broader powers.

The committee will co-operate with similar organizations of other countries and will devote itself particularly to problems connected with the utilization of military areoplanes and aviators for civil purposes after the war. While comprehensive plans are to be formulated as soon as practicable, it is not proposed to divert agencies of military value to this work until the war ends.

The members of the committee, appointed from the personnel of the committee for aeronautics, are:

Chairman, Dr. W. F. Durand; Dr. S. W. Stratton, director of the United States Bureau of Standards; Prof. Charles F. Marvin, chief of the United States Weather Bureau; Lieut. Col. V. E. Clark, Signal Corps, and Lieut. Commander J. H. Towers, U. S. N.

Additional members may be designated as the work develops.

Miss Frances Grahame Hunter Married to Curtis B. Munson

Providence.—Announcement was made by Mrs. Duncan Hunter of the marriage of her daughter, Miss Frances Grahame Hunter, to Mr. Curtis Burton Munson, of New York, in Paris, France, on October 27.

As the bridegroom is serving with the Lafayette Escadrille and could not come to America at this time, the bride started for Paris several weeks ago. The wedding was attended by a small group of friends. Mr. George Haven, of New York, was best man.

The bride is the granddaughter of the late Governor Lippitt, of Rhode Island, and a niece of Mr. Henry P. Lippitt, once a United States Senator from Rhode Island, and of Mr. Charles Warren Lippitt, once Governor of this State. Her sister is Mrs. Doolittle, wife of Lieut. Lytton Doolittle, U. S. N.

Mr. Munson is a son of Mr. and Mrs. Robert H. Munson, of 46 West Fifty-second Street, New York. He and his brother, Mr. Alexander M. Munson, were graduated from Yale in 1916. Both enlisted first in the American Ambulance Corps, and have been on duty in France since.

Wireless to Detect U-Boats

To assist naval airmen in detecting the presence, and then determining the position of enemy submarines, a delicate instrument of considerable ingenuity has been produced. An adequate conception of its character is afforded without necessarily discussing its technical details, which for obvious reasons are withheld. Roughly, it consists of a compact buoy that carries a receiver which converts the sound-waves from a submarine's propeller into electrical energy. When thrown overboard by an airman, it floats on the surface of the water. Upon the approach of a submarine within a certain radius of it, the antenna attached to the buoy sends out wireless signals which are in turn picked up by receiving instruments installed in the aircraft. The presence of a boat within this area is thus announced. Its general position in relation to the buoy, as well as its movements, are indicated by the intensity of the signals.

FOREIGN NEWS

BELGIUM

On November 15 a bombing raid was attempted by British naval aircraft on the Uytkerke (Belgium) airdrome, but owing to very high winds the formation did not proceed to its original objective, but dropped a large number of bombs on the aeroplane sheds near Handzaeme.

In the course of offensive patrols two enemy aircraft were destroyed and two driven down completely out of control. All the British machines returned safely.

FRANCE

Paris, Nov. 16.—"German aviators bombarded the region south of Nancy," says this afternoon French war statement. "There were no victims."

The Rhine-Marne Canal flows through the region south of Nancy. According to Berlin statements, it was along this canal that Germans first encountered American troops in France.

Nov. 24.—The records of French aviators, including the members of the Lafayette Escadrille, for ten months ended Oct. 31, show that they destroyed 120 German aeroplanes over the French lines, and 397 over the German lines, whose destruction has been fully confirmed.

There were 513 others over the German lines which probably were destroyed, but confirmation of the fact was not obtainable. This makes a grand total of 1,030.

Twenty-two German captive balloons also were destroyed.

G. H. Perris, with the French armies, in a special cable to the N. Y. *Times* on Nov. 25, says that there has not been in the recent fighting on the front in France much sign of the revival in German aviation for which great efforts have certainly been made since the appointment of General von Hoepner as dictator of the air services of the empire a year ago.

Some forces must have been drawn away to meet the needs of the Italian offensive, and the losses of machines in France and Belgium have been very heavy. The French Army in the last ten months has brought down 517 German planes, to say nothing of more than a score of observation balloons, and it is believed that 513 more aeroplanes fell within the enemy lines.

Markedly in advance of the Allies at the beginning of the year, Germany was at the time of the battle of the Somme no less markedly behind them in this arm. General von Bülow admitted it plainly in an alarming report. An effort to recover at least an equality was at once begun, and it was further stimulated by the entry of the United States into the war and the fear of what that would presently mean. Various favors were accorded to aviators, and thousands of vigorous men were attracted into the service. Manufacturers were stirred up, and by the end of last August thirty new aeroplane and hydroaeroplane factories had been established, while older makers had greatly extended their works.

The chief attention was given to squadrons of chasing planes and bombarding groups. Albatross and other types were standardized. The Gotha works at Erfurt received large orders, especially for their three-seater, double-motor bombarding plane. The best Benz and Mercedes motors were also standardized, and the personnel of the hangars was enlarged, a squadron of six planes having attached to it 100 or even 120 men. Among the other types favored may be mentioned the light and rapid Halberstadt-Rolland, the Fokker triplanes, and also that rapid riser, the 1917 Rumpler, with a Mercedes 200 h.p. motor, which is at present the best German scouting plane, and the new Junker machine, with a wholly metallic body, which is intended to accompany an infantry advance. The two-motor bombarding planes can carry 1,600 pounds of bombs, and can rise to a height of 3 miles in 40 minutes.

The service enjoys such advantages as belong to a practical dictatorship, and yet the only direction in which it has decidedly scored is that of promiscuous slaughter in London and in such French towns as Nancy, Dunkirk, and Bar-le-Duc. On the front the French maintain their superiority. In all of the French offensives of this year, particularly at Verdun and on the Aisne, it has been clearly shown, and on several critical occasions the enemy planes have been practically driven from the field.

In a recently published list of "aces," as the French call pilots who have brought down five or more adversaries, there are forty-eight French names, thirty-seven of the men being alive and eleven dead or missing, against fifty-seven Germans, of whom, however, twenty-nine were in the latter category; so that the French had a considerable superiority in surviving champions.

Favorable as the situation is, it would be a great mistake to underestimate the efforts the German Army and its industrial partners are making. The 100 machines per month destroyed by the French and those similarly disposed of by the British are far from neutralizing the output of the German factories, and superiority in this essential arm of modern battle cannot be pushed too far.

GERMANY

A report from Berlin on Nov. 16 states that since November 9 the Allies have lost twenty-four aeroplanes in aerial encounters and by German anti-aircraft fire.

Thirty German military aviators, each of whom had brought down four or more of their adversaries, according to the German count, have been destroyed by the Entente Allies' airmen during the last year, as established by information collected from the mortuary columns of German papers. The list includes:

Lieutenant Werner Moss, of Crefeld, with 47 machines to his credit; Captain Boelke, with 40; Lieutenant Wolf, 33; Lieutenant Schafer, 30; Lieutenant Almenroeder, 30; Lieutenant Richthofen, 24; Lieutenants Wintgens and Baldamus, 18 each; Lieutenant Frankel, 17; Lieutenants Immelmann and Dassembach, 14 each; Second Lieutenant Nathaniel, 14; Second Lieutenants Festner and Pfeiffer and Lieutenants Manschott, Hohndorf, Arigi and Tutschaat, 12 each; Lieutenants von Kendall, Kirmaier, Theiller and Serfert, 11 each; Lieutenant Thulzer and Captain Behr, 19 each; Lieutenants Leffers and Schulte, 9 each; Lieutenant Parschan and Second Lieutenant Schilling, 8 each; Second Lieutenant Immelmann, 6, and Lieutenant Riesinger, 4.

Amsterdam, Oct. 30.—Baron von Richthofen, Germany's star airman, who is at home on long leave, has just been married to Fraulein von Minkwitz, the heiress of the Duke of Saxe-Coburg's Master of Horse.

On the occasion of the marriage the Emperor appointed Richthofen his "Equerry Airman," and it is said that in consequence of this appointment he will henceforth devote his time entirely to the training of new fighting squadrons.

GREAT BRITAIN

Behind the British Lines in France.—More than one squadron of the new Australian flying corps is now at work on the western front. An Australian has already brought down a German, and another is missing after a flight over German territory.

An Australian airman was attacked by several Germans recently and brought down in No Man's Land. A British officer, seeing the machine fall, went out from the trenches alone to attempt rescue. For the first part of the way he managed to keep under cover, but the last part was open.

Just before he reached the machine he was hit, but went on, and found the Australian lying in a shell hole, badly wounded. The British officer crawled back with this information, and the Germans later permitted the man to be brought in under a white flag. Both men are recovering.

London, Nov. 21.—An official statement on aviation operations issued to-night said that only five German machines were seen on the Cambrai battlefront yesterday. The British machines worked against the difficulties of mist and rain and eleven of them are missing. The statement reads:

"On Tuesday our aeroplanes attempted to work throughout the day in conjunction with our operations between St. Quentin and the River Scarpe. Low clouds of mist and a strong westerly wind, with an occasional drizzle of rain throughout the day, made it necessary for our patrols to fly fifty feet throughout the day. Even at that height they were at times quickly lost in the mist.

"Continued attempts were made to maintain contact with our advancing troops, but this was rendered almost impossible by the weather conditions. Many bombs were dropped on enemy batteries, lorries, airdromes, transports, and railways. Batteries and small groups of infanry were attacked with machine gun fire. Very valuable information was gained despite the very difficult weather conditions.

"Only five hostile machines were seen all day on the battlefront. Eleven of our machines are missing, their loss being due to the mist and exceptionally low height at which they were compelled to fly."

Baron Rothermere, chief proprietor of the *Daily Record and Mail* of Glasgow and the Leeds *Mercury*, has accepted the post of Air Minister in the British Cabinet, according to the *Pall Mall Gazette* on Nov. 24.

Baron Rothermere (Harold Sidney Harmsworth) is the younger brother of Viscount Northcliffe. He was born in 1868.

The post as head of the Air Ministry was offered to Lord Northcliffe recently by Premier Lloyd George. In declining the position Lord Northcliffe explained that his refusal was due to dissatisfaction with some of the methods of Mr. Lloyd George's Administration.

London.—The following report on aerial operations was issued on the night of Nov. 25:

The weather was bad Saturday, but several aerial reconnoissances were carried out. In the battle area bombs were dropped on the enemy and machine gun fire was opened against his troops. In the afternoon the violence of the gale made it almost impossible for machines to leave the ground. One of our aeroplanes has not returned.

The following report on the air fighting on Friday was issued:

The enemy's aeroplanes showed more activity in attacking our bombing and low-flying machines. During the night a short spell of fine weather enabled our machines to continue their bombing of the enemy's railway stations.

In the air fighting six hostile machines were downed. Nine of ours are missing. Two of these were seen to collide over the enemy's lines.

ITALY

On Nov. 19 enemy troops repeatedly were bombarded in the course of the day by Italian aeroplanes, and in the night, in spite of a strong wind, by Italian airships at the Basin of Primolano, to the northwest of Susegana and at Tezze di Livenza.

Venice, Nov. 18.—The rumble of guns is heard throughout the city by night and day as the fleet and the Venice coast batteries shell the enemy at the mouth of the Piave. At 3 o'clock yesterday afternoon an Austrian aeroplane flew over the city, but it dropped no bombs. The land batteries of Venice did not fire, but when the machine flew over the Grand Canal Italian torpedo boats discharged a score of shots with effect.

An official dispatch from Rome on Nov. 20 says:

"Enemy aeroplanes continue to throw pamphlets to our soldiers in which they express their benevolent disposition toward the invaded towns and the populations, also assuring the soldiers that the Austrians have a scrupulous respect for international law, and that the present occupation of our territories has only temporary military character, without aims of conquest.

"This system has the immediate purpose of weakening the fighting spirit of the Italians, trying to make them feel that there is no need of fighting longer if the invaded regions are going to be returned without further sacrifice on their part. To the enemy's snare the Italian soldiers reply with multiplied ardor in the fight."

TURKEY

During a recent air raid over the Gallipoli Peninsula and Constantinople by British naval aviators the former German cruiser Goeben, now the Turkish warship Sultan Selim, was hit and a large explosion caused, it was officially announced on Nov. 16.

A vessel named the General, and reported to be the German headquarters at Constantinople, was twice hit by bombs. Two hits also were obtained on the Turkish War Office.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Scout Aero Club of Indiana

THE report from the Scout Aero Club of Indianapolis, Ind., states that Mr. Earl Robinson, an amateur, made a flight of 1,600 feet and a duration of 50 seconds during a qualification meet. Mr. Hall Marmon made his model fly 2,000 feet on several occasions. The 1500-foot mark has also been reached by Mr. Paul Stanley. As far as duration is concerned, the club seldom falls below the 50-point mark. President Loutt, of the Scout Club, is a consistent flyer and on one occasion, unofficially, obtained a distance flight of over 2,000 feet, ninety-five seconds' duration. Officially his record stands at 1,500 feet with sixty-one seconds' duration. Most of the records of the club are accomplished with models measuring over 40 inches, weighing from four to six ounces.

Mr. Loutt states that Miss Ruth Law appeared to be very much interested in the demonstration made by the Scout Club at the State Fair.



Mr. Samuel S. Perkins and one of his men carrying kites. Supplementing the story which we published in our issue of November 12th Mr. Perkins states that man-carrying kites can also be used to good advantage to lift targets for anti-aircraft guns. The kite itself, in many cases, is a good target if the large kites are used and they will stay in the air until a stick is broken, although they may be full of holes.

William A. Kohler

William A. Kohler, alias "Wild Bill," of North Island, San Diego, Cal., whose cleverly constructed J. N. 4 model was featured in one of our recent numbers, has received kind consideration from the San Diego *Union,* referring to his achievement as follows:

"One of the finest constructed model aeroplanes, probably, in this country, has just been completed by W. A. Kohler, a mechanician attached to the signal corps aviation school at North Island. The model is an exact replica of the modern reconnaissance machine and is valued by Kohler at $500.

The model has been constructed on a scale of three-fourths of an inch to the foot. The tiny aircraft has a wing spread of 38½ inches, while the length of the fuselage from the imitation square tube radiator to the tip of the elevators is 19½ inches. The wing sections have a one degree dihedral and are slightly staggered.

Kohler did not overlook a single mechanical item in constructing the novel aircraft model. It is equipped with shock absorbers on tail skid and landing gear, is fitted with Dep controls that work the wing ailerons and elevating gear, foot controls for the rudder, upholstered cockpit, wind shields, laminated propeller, wing skids, strut fittings, and pneumatic tires with spoke wheels.

The clever aeronautical mechanician is now building a model aircraft with a twin fuselage and twin motors. It will be equipped to carry three miniature machine guns, two of which will fire through the hub of the propellers. A small fuselage in the center will carry the pilot and observer. This model will be placed on exhibition at a local sporting goods store when completed.

Kohler has been building aeroplane models for ten years. He holds practically all the world's altitude and sustained flight records for model aeroplanes of scale design. One of his model aeroplanes loops the loop after attaining an altitude of 1500 feet."

The Correspondence Model Aero Club

The Correspondence Model Aero Club is progressing rapidly. Word has been received that Mr. Louis A. Mathieu, of Eagle Grove, Iowa, has been chosen as secretary. Copies of the constitution are now ready and will be sent to anyone who is interested in model aircraft upon request. Members are still solicited.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

How to Apply for a Situation

The Joy-Stick prints a reply to a recent advertisement in the Aviation press, bearing an undoubted Yankee flavor, to which a reader to applies it in the following strain:

At the same time as he sent in his application he forwarded them a copy, and hereunder who may be tempted to apply for a similar position.

DEAR STEVE:

Saw, Boss, I guess you can cut out your ad. in the current "Fly-Journal." I'm the wise guy you're looking for. Height, 10-ft. 1-in., weight 22-lbs., married on three different occasions, 15 in boots, and size 14½ in neck wrappings. Hell! There is no Goddamn need to advertise when you knew this bright specimen was waiting to slip into your factory.

I kinder guess it would take five foolscap volumes to recite my qualifications, but you can take it from me, Steve, that I'm the best bit of shop soiled goods that ever crossed the duck pond.

Say, it was my organising genius that incited the Yewnited States to war, and if that aint a copper-plate guarantee of my professional abilities I guess I'll swaller my best billy-cock hat in one gulp.

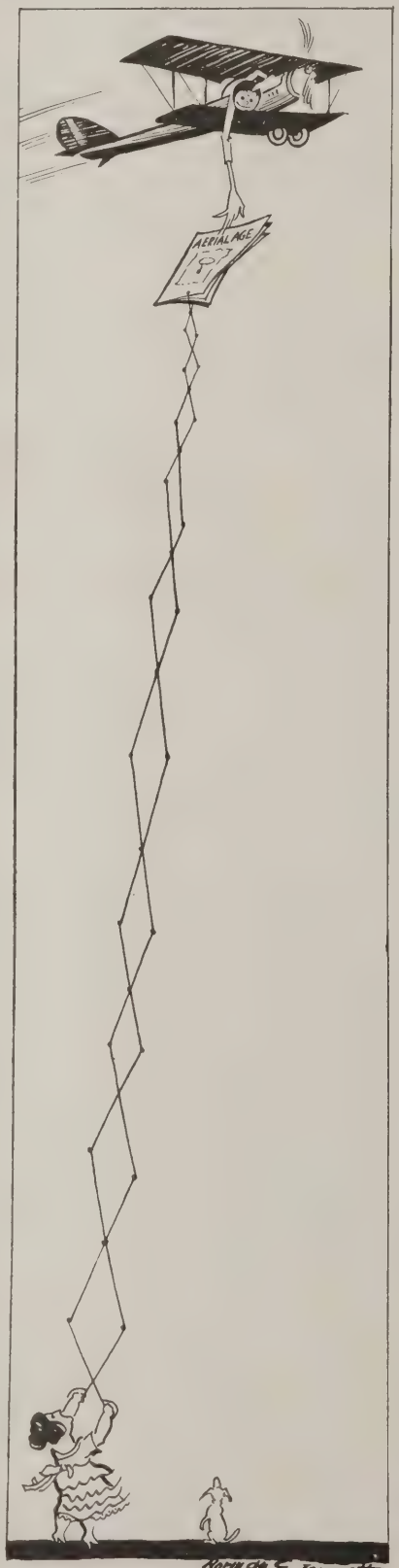
I suppose you are the wise guy that's chucking these huge salaries about, but, believe me Kid, it's the redhot brass I'm handling, and nothing under five thousand dollars per minute would persuade me to cut my present job and reorganise your shanty.

Bet on me, Steve, I'm no penny word juggling merchant, but the real Bird's Custard in brain waves, and the aeroplanes I'll design for you would make an Egyptian mummy sit up and take notice.

There are many things come out of the States, but I'm the real guy in brain hustling, and you can bet on the tail of your best Sunday shirt that your factory will be some jig-saw puzzle after I arrive.

Say, Kid, a Marconomigram will fetch me instant, but, believe me, unless the salary is the last word in transparent pay envelopes, you don't tempt me from my present job, which is tram-conductor at an asylum.

Say, Jim, you get me guessing when you say tactful and diplomatic, but on any boozewrangling stunt I could always be chockful and pneumatic, and I guess my pleasing personality would stop any grandfather's clock that ever came out of Switzerland.



Pat's idea of how to get the latest aeronautic news to an Aviator who was absent-minded enough to have left it behind.

Believe me, Chick, I'm the slickest thing in impressive personalities that ever came out of Libby, McNiel and Libby's, of Chicago, and if you saw the queue of peaches in skirts that hang round my door on a Sunday morning, you would not need to guess how strong my pleasing personality is.

I'm the guy who founded Pelman's, put the froth on Bass's ale, and invented the Maltese Cross for Good Friday buns. Say, the Panama Canal was a dime show stunt to my development of my San Francisco Exposition, and I'm the bloke who invented the cloud hanger for distressed aviators.

My stars, Boss, what the blue steam a snap judgment is I cannot guess, but I guess I fill your qualification *re* men-measuring, for I was for ten years the cutest tailor that ever did a stretch in Sing Sing.

My genius would make the statue of Liberty look like a ten cent powder-monkey, but if the waiting game you refer to is a waiting-for-salary stunt, I guess you can put me on the retired list now.

I'm no wage freezer, but the best bit of frozen mutton that ever dodged a U-boat, and if I can't make your factory the handiest bus producing establishment on this earth I'll pawn my best Sunday shoes and walk down to see you on my head.

Say, Steve, hurry up with a reply, I'm bursting to get my hands on that filthy lucre that you are so anxious to kiss good-bye to.

Yours till Hell freezes,
SIX-CHAMBERED BILL.
(Or the man who invented kiss-me-hand.)

Flooey

A Flea and a Fly in a Flue:
Said the Fly to the Flea, "Let us Fly."
Said the Flea to the Fly, "Let us Flee."
So they Flew thru a Flaw in the Flue.

Advice Column

Dear Sir:

While walking along the Drive the other day I noticed how easily a flying boat rose from the surface of the water. It all seemed rather queer to me, and I am writing to find out just how it was accomplished.

Much obliged,

Letme Know.

The matter of getting flying boats to rise from the water is a very simple one. The entire bottom of the boat is covered with grease to eliminate any possible friction. After the machine has gathered momentum it slips lightly over the water and the grease, which has a tendency to rise in water, helps lift the boat out of the water and into the air.

9.705
E A
Aeronautics

AERIAL AGE WEEKLY

ol. 6, No. 13 DECEMBER 10, 1917 10 CENTS A COPY



British Anti-Aircraft Artillery in Action (Official Photo)

NOTICE TO READER

When you finish reading this issue lace a one-cent stamp on this notice, and same to any postal employee, and will be placed in the hands of our oldiers or sailors at the front.

NO WRAPPING—NO ADDRESS
A. S. Burleson, Postmaster-General

$1,032,294,260 Asked for Army Aeronautics

Hispano-Suiza



Security



Wright-Martin

New Brunswick, New Jersey., U.S.A.

Aircraft Corporation

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THE TRADE AUTHORITY

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$1,032,294,260 ASKED FOR ARMY AERONAUTICS

THE outstanding feature of the army estimates submitted to Congress December 3, is a request from the Signal Corps for a lump sum appropriation of more than $1,000,000,000 for the aviation side of the war during the fiscal year 1919 (July 1, 1918-June 30, 1919).

That such an appropriation had been asked for was a great surprise even to many of the advocates in Congress of aviation development on a colossal scale. The lump sum appropriation is in addition to the appropriations asked for the regular support of the signal service of the army, just as the lump sum of $640,000,000 granted last summer was in addition to the regular appropriations for the fiscal year 1918.

The total sum asked for by Major Gen. Squier, the Chief Signal Officer of the army, for the signal service for the fiscal year 1919 is $1,138,240,314.77. Of this total $1,032,294,260 is sought for the aviation section alone, while $105,946,054.77 is for other objects in which signal service is interested.

The manner in which $1,032,294,260 is to be spent on army aviation is disclosed in the book of estimates, which shows that the principal items are $553,289,120 for extra engines and spare parts for aircraft, $235,866,000 for aeroplanes and hydroplanes, and $77,475,000 for machine guns for aeroplanes. The items in detail are:

Aeronautical salaries of instructors in flying, instructors in ballooning, aeronautical mechanical engineers, inspectors of aeroplanes and aeroplane engines, factory inspectors, consulting engineers, accountants, clerks, bookkeepers, draftsmen, plant engineers, photographers, military storekeepers, and wages of packers, chauffeurs, aviation mechanicians, model and instrument makers	$9,012,600
Wages	544,200
Lighter-than-air equipment	8.171,000
Spare parts and accessories	47,173,200
Aeroplanes and hydroplanes	235,866,000
Extra engines and spare parts	553,289,120
Maintenance, upkeep, and operation of air squadrons	20,950,000
Aero stations in United States	20,400.000
Aero stations in Panama	9,420,000
Aero stations in Hawaii	4,420,000
Maintenance of buildings in Europe	9,127,000
Purchase of land	16,700,000
Warehouse and supply depots	5.595,000
Aviation clothing equipment	1,358,440
Expenses of officers, enlisted men, and civilians on special duty	67,200
Vocational training	120,000
Mileage to officers and traveling expenses of civilian employes	3.050,000
Schools of military aeronautics	8,050,000
Machine guns for aeroplanes	77,475,000
Development of new types of aeroplanes and engines	2,000,000
Contingent expenses	3,405,500
Construction	100,000
Total aviation	$1,032,294,260

The sum of $105.946,054.77 which the signal service asks for purposes other than aviation, includes $46,163,733.39 for mobile army equipment, $1,369,089.60 for radio equipment, $21,708,877.50 for motor vehicles, and $35,191,914.28 to restock and maintain an adequate signal supply depot with the American expeditionary forces in France.

The item of $9,012,600 for aeronautical salaries of men identified with the work of the aviation section calls for 376 instructors of flying—four at $5,400, four at $5,200, thirty-two at $4,800, twenty-four at $4,200, ninety-two at $3,600, twenty-four at $1,509 and 196 at $1,200.

Part of this sum will be spent on the employment of thousands of inspectors of aeroplanes under construction. The estimates call for ten inspectors of aeroplanes and aeroplane engines at $3,000 each, forty at $2,400, 100 at $2,000, 1,500 at $1,800, 800 at $1,600, 950 at $1,400 and 600 at $1,200 each, a total of 4,000 inspectors. There are also estimates for seventy-five factory inspectors at $2,000 each, sixty at $1,800, and 140 at $1,400.

But General Squier's estimates of $1,138,240,314.77 for the Signal Corps do not represent the whole cost of the Signal Corps. They do not include the items for the pay of officers and men estimated for by the Quartermaster General. These latter are submitted in the same book of estimates under the heading of "Pay of the army."

Pay of 11,941 officers	$27,619,533.00
Aviation increase	10,030.800.00
Additional pay for length of service	100,000.00
Pay of 153,945 enlisted men	60,606,607.05
Aviation increase	4,916,800.00
Additional pay for length of service	150.000.00

These figures show that under the heading of pay of officers and men something like $100,000,000 must be added to the estimates which General Squier submitted.

In addition to this request for funds for naval aviation, Congress is asked to make an appropriation of $260,000 for the work of the National Advisory Committee for Aeronautics. This is to be used for scientific research, technical investigations and special reports in the field of aeronautics, including the equipment, maintenance and operation of a research laboratory.

RUBBER ASSOCIATION OF AMERICA ENDORSES HUGE AIR PROGRAM

MR. Harvey S. Firestone, president of the Rubber Association of America, whose offices are at 17 Battery Place, New York, announced, on November 28, the appointment of a special committee

"To study and determine how the association can best assist the Government in the war, particularly how to bring about the construction and utilization of aircraft in overwhelming numbers at the earliest possible date and to act in accord with any conclusion it may reach, to the end that the present horrible war against civilization may be ended by the complete victory of the Allies in the shortest possible time, and thereby maintain for ourselves and our posterity the principles of human liberty."

The Committee consists of Messrs. Edgar V. Davis, Direc-

tor of the United States Rubber Company, 1790 Broadway, Chairman, and Mr. Harvey S. Firestone, President, Firestone Tire and Rubber Company, Akron, Ohio; Mr. Paul W. Litchfield, Vice-President and Factory Manager, Goodyear Tire and Rubber Company, Akron, Ohio; Mr. Charles B. Raymond, Second Vice-President, the B. F. Goodrich Company, Akron, Ohio; Mr. George B. Hodgman, President, Hodgman Rubber Company, Tuckahoe, New York; Mr. C. T. Wilson, President, C. T. Wilson, Inc., 56 Wall Street, New York City; Mr. Harry T. Dunn, President, Fiske Rubber Company, Chicopee Falls, Mass.

The Rubber Association of America is made up of practically all the firms engaged in the rubber business in this country and has 330 members, the combined business of whom will amount to about $700,000,000 this year.

The appointment of the special committee was decided by a resolution adopted at the annual meeting of the Association held at Akron, Ohio, on November 19th.

Caproni Convinced Mammoth Air Program Must Be Rushed

YOU think that Paris, Lyons, Le Creusot, Saint-Etienne, Saint-Chamond will be bombarded from the air?"

"Yes, and with a frequency that has never been imagined. It is my duty to say so. The danger is self evident. One must not remain silent. In order to cope with it, let us throw full light on the question and hold ourselves ready."

The above are question and answer in an interview with Signor Caproni, reported by a correspondent of the Paris Journal L'Auto.

Describing the great Italian aeroplane constructor, the correspondent says: "He is of medium height, broad shouldered, dark complexioned, with big and expressive eyes. Such is Caproni; a character in every sense of the word, a will of iron seconded by a brilliant intelligence."

In another interview for "L'Auto" Signor Caproni stated:

"Our results have not been obtained without difficulty," said Signor Caproni. "At the beginning of the war no one believed in the big bombarding machines, and when my first 'monster' emerged from the factory to take its place in a squadrilla very few were the aviators who regarded it as other than a curiosity or who had faith in its future."

"And the enemy?" asked the correspondent.

"The enemy is hard at work, be sure of it," was the reply. "Having formidable labor resources at his disposal, well disciplined labor, directed by engineers who manifest all the severity of officers, he is turning out his Gothas and his Friedrichshafens with incredible speed. Next spring we shall witness the budding forth of a fantastic German effort in aviation. For the first time during the war the rear will suffer almost as much as the front."

"And the Allies?" was the next question.

"The Allies, too, will carry death and desolation into the heart of the enemy's countries, but if they wish to be the first they must not lose an instant, for, I repeat, the enemy will be ready for a 'kolossal' effort by next spring. Therefore, let us be ready, work unceasingly, increase our output. It is no longer a time for words, but for acts."

"And it is with an aeroplane of the Caproni type that you expect to cross the Atlantic?"

"Certainly; and I shall replace the weight of the bombs by a stock of petrol sufficient for the voyage."

"Do you believe in the utilization of aeroplanes for practical purposes after the war?"

"Yes; for the postal services-intercontinental and long distance—the transportation of passengers in cases of extreme urgency, and for short and frequent crossings, such as between Dieppe and Newhaven, Boulogne and Folkestone. It will be a rapid means of transport."

Such accessible centers as Essen and the industrial cities on the Rhine, Caproni asserts, should be attacked en masse by great fleets of giant aeroplanes. The distance to Essen, for instance, from the French front is only 200 miles; about half the distance recently negotiated in four hours between New York and Langley Field. The actual experience of bombardment will create a tremendous moral effect and serve to increase the discontent of the German population.

The successful and complete destruction of the submarine can only be accomplished effectively by attacking at the source—the industrial center, and the submarine base. Caproni declares that if this policy were followed "the victorious end of the war will be hastened." The year 1914 was the year of the Marne. The year 1916 the year of Verdun. The year 1917 the year of English effort and American intervention. Can it be that the year 1918 will be the year of aviation, that is, the year of victory by air domination?

The Four Great Airways

(Editorial in the Syracuse *Post-Standard*)

THE Aero Club, foreseeing the need of regulation of flying, have laid out four transcontinental routes which will be the air-pikes of the country, named the "Woodrow Wilson," "Wright Brothers," "Langley," and "Chanute and Bell" airways.

The designation of routes is necessary primarily that service stations may be established along the way. The aeroplane demands more constant attention than the automobile. It must, whenever it comes to land, be examined by a mechanic who understands it. The trip from Boston to Chicago will be made by three jumps. So when the aeroplane drops to earth at Syracuse, there must be not only a landing station here conspicuously marked but fuel and cover and expert attention.

Because the Aero Club is plotting the courses over which the flights will be made and describing the landmarks so that the pilot may find his way, doesn't mean that a passenger service is imminent. The busy American could make the trip from New York to Chicago in eight hours by air, and the cost should not be higher than by rail, but he will stick for a while to the slower Twentieth Century. It is the mail service that will pioneer the air routes—not that the post office has demand for greater expedition than the railroads give but that the government can well afford to subsidize flying experiments, as it should be subsidizing new mail routes by sea.

The Aero Club is not, therefore, induging in fancy in mapping airways. Over those airways the aviators will be carrying mails within a few years—and how long after the new vehicle has demonstrated its safety as well as its speed for mails will it be before men are traveling in it?

WINGS

UP from the earth he speeds on rushing wings,
Conquering regions of uncharted air;
Nor as a timid Dædalus he springs
From height to dizzy height to do and dare;
To seek the braggart foeman in his cloudy lair!

As bold, as brave, and buoyant he of heart;
His spirit light as evening's gauzy cloud,
He strides the wind, and fearless cleaves apart
The banking mists that Hell would make his shroud,
For lo! the preying falcon stoops, exulting, loud!

He hears the stinging hiss of deadly hail,
And devil-hammer of down-level gun;
Nor at the test does his high spirit quail,
Nor thought possess him that his race is run—
Great heart that sudden finds the foeman ten to one!

Bloody and shattered drops the skilful hand,
And effort is an effort now, at last;
His weapon rests inert as the fell band
Spit fire and fury, closing on him fast,
And he, so oft a victor, knows his day is passed!

Then dives one, firing, by him like a flash,
His quickened senses urge the swift pursuit,
And down with sudden meteoric dash,
He strikes the striker; and as one they shoot,
Whirling, entwined, to earth by what a fearful route!

But death came quick to cut the bond in twain. . .
Still lies his body on the blazing pyre.
Dear lad, that flew for neither praise nor gain!
Lo! The freed spirit, purged of ill desire,
Has soared to God on wings that pass unhurt through fire!

—*By an Anonymous Writer in the London "Spectator."*



THE NEWS OF THE WEEK



Liberty Engine to Be Discussed

New York City.—"The Reasons Behind the Liberty Engine" has been scheduled as one of the leading engineering subjects to be considered by the Society of Automotive Engineers at its Winter meeting in New York, on Thursday afternoon, January 10. Major Jesse G. Vincent, who was largely responsible for the design of the engine, and who is now in charge of its development, at the aviation headquarters in Dayton, Ohio, will present a special address going into the engineering reasons of the present twelve-cylinder Liberty Engine. Instead of presenting a prepared address, which would have to be completed several weeks in advance Major Vincent is going to deliver a comprehensive talk which will bring the question of aviation engineering up to the last minute.

After Major Vincent has handled the subject a special discussion will follow. It will be opened by Colonel Clark, who is chief in charge of aviation engincering in the Signal Corps. His phase of the discussion will have to do with military requirements of aviation engines.

Following Colonel Clark, Captain Howard Marmon, who made an extensive investigation of aviation engineering in Europe some months ago, and who is now engaged in aviation engineering work with Major Vincent at Dayton, will talk on the engineering comparison of the Liberty Engine as compared with European practice.

The discussion will be further carried out by H. M. Crane, engineer of the Simplex Company, who has had a great deal of experience in the building of European aviation engines during the last year. His subject will have to do with adapting European engines to American methods of manufacture. Mr. Crane's talk should disprove of so many rumors floating around regarding how easy it is to bring an engine from Europe and start producing it in quantities in America. Mr. Crane is so thoroughly posted on all questions of aviation engine design that he is well qualified to discuss the Liberty engine from a designing and a manufacturing viewpoint.

"The reasons back of the Liberty engine" will only constitute one portion of the afternoon program on Thursday, January 10. An equally interesting subject along another line of engineering activity will comprise the remainder of the program.

Tickets for the Automotive Industries dinner to be held at Hotel Biltmore, New York, on Thursday evening, January 10, are selling rapidly. Already checks for 281 tickets have been received at S. A. E. headquarters.

Tickets for the War Dinner to be held in Chicago, Friday evening, February 1, at the New Morrison Hotel, are selling well. To date checks for 214 have been received.

The Chicago program for the afternoon session of Friday, February 1, which is the Friday of Chicago show week, will deal with tractor problems. Several very important papers from tractor engineers are already in course of preparation for that meeting.

French Account for 1,030 German Aeros

The brilliant record of the French aviators including the members of the Lafayette Escadrille, for the ten months ending in October, shows that they destroyed 120 German aeroplanes over the French lines, and 397 over the German lines, which destruction has been fully confirmed. There also were 513 others over the German lines which probably were destroyed but confirmation of the fact was not obtainable. This makes a grand total of 1,030. Twenty-two German captive balloons also were destroyed.

"Garabed" to Congressional Notice This Session

Not discouraged by the fact that President Wilson killed the "Garabed" Free Energy bill by a pocket veto last session, Garabed T. K. Giragossian, the Naturalized Armenian from Boston, has appeared early in Washington, and will bring his Free Energy bill to the surface again.

Congress will be asked again to provide for a demonstration of his invention with the intent of turning over the patent to the government for use during the war. Mr. Giragossian said that he had the assurance of a number of leading congressional members that provision would be made for the necessary demonstration at this session.

Mattison New York Office

For the convenience of its clients the C. Mattison Machine Works, has opened a New York office in the Times Building, which will be in charge of Mr. J. V. Parks.



M. W. Hanks, Chairman of the Standards Committee of the Society of Automotive Engineers, who is rendering excellent service in aeronautic standardization.

M. W. Hanks, Standardizer

Some of the work of most far reaching importance of the Society of Automotive Engineers is done by the Standards Committee, and the efficiency of the various divisions is materially increased by the masterly way in which the Chairman, Mr. M. W. Hanks of the parent committee, performs his duties.

Mr. Hanks was born in Madison, Wisconsin, in 1875. He attended the University of Wisconsin from 1894 to 1897, and subsequently entered the apprentice course of the Westinghouse Electric and Manufacturing Co. He was transferred in 1898 to the Nernst Lamp development in the laboratory of Mr. George Westinghouse, and was electrical engineer of the Nernst Lamp Co., until 1904.

During his association with the Nernst Lamp Co., Mr. Hanks opened and operated the Barringer Mine, located in Llano County, Texas. This was the first mine of its kind ever operated for Gadolonite, an ore of Yttrium.

The development of the Glower, the light giving element of the Nernst lamp, and the progressive system of manufacture were his principal work. A number of patents were taken out on the Glower and terminal, the latter becoming known as the Hanks terminal. The semi-automatic terminal machinery, employing the electric furnace, made it possible for one operator to turn out 10,000 Glowers a day in place of 300, previous to the introduction of the machine.

Mr. Hanks resigned his position with the Nernst Lamp Co., in 1904, to go into the manufacture of a standard high-grade motorboat, and became President of the Hankscraft Co., with headquarters in Chicago. He returned in 1913 to the Westinghouse Electric & Mfg. Co., and became Western Representative of the Automobile Equipment Department.

In the spring of 1917, he took up his present work as Standards Manager of the Society of Automotive Engineers and every automotive engineer in the country and in the allied countries, is familiar with the excellent work which he has done for practical standardization.

Sperry Flies to Home in Flatbush for Sunday Dinner

Lawrence Sperry was invited to have dinner with his father at the family home, No. 1505 Albermarle road, Flatbush and he went there, or almost there, in his big Curtiss Triplane. After dinner he took each of his two sisters for a flight, gave rides to several men and a little after four o'clock started back for his hangar, at Central Park, L. I.

Altogether it was one of the most thrilling afternoons Flatbush has had in a long time. A little before one o'clock the residents of Flatbush were roused from their Sunday papers by the whir of an aeroplane motor. Quickly the houses emptied and thousands of persons saw a big triplane doing the most daring "stunts" a thousand feet aloft.

Mr. Sperry, who was accompanied by a mechanician, looped the loop several times above the Parade Ground at the southern end of Prospect Park, and then did a feat that made all on the ground hold their breath, especially his two pretty sisters, who had been awaiting him. From a height of about one thousand feet, Mr. Sperry stood his machine on its head and started to dive straight down. Every one was certain he had lost control and that the aeroplane would be smashed and the occupants killed. But, a hundred feet from the ground the aviator straightened out and the aeroplane turned and floated away, making a far circle, and then returned and made a perfect landing.

There are six football fields laid out on the Parade Ground, and therefore there were twelve goal posts the aeroplane had to avoid in making the landing. Mr. Sperry guided his big flier among them successfully, although he had to hop over one, and stopped right up close to the Park Department building at the western end of the field, where his father and sisters were waiting for him.

There Mr. Sperry shook hands with several aviation officers, who also had been waiting, and the party went to the Sperry home for dinner, while 20,000 persons flooded onto the Parade Ground to have a look at the machine they had seen looping the loop.—*New York Herald.*



The Continental Pusher, which makes a speed of 95 miles an hour *Photo passed by the Censor.*



© Underwood & Underwood.

A remarkable photograph of a German machine with the observer indicating clearly by raising his hands above his head that he had had enough.

Planes of Five Types Flown at Central Park

The holiday crowds that gathered Thanksgiving Day at Central Park, L. I., besides witnessing a variety of aerial acrobatics and passenger-carrying flights by Bert Acosta and J. Petre, saw a number of aircraft types represented at the field. Mention may be made of the machines as none bear the insignia of the U. S. Air Service.

The Berckman Speed Scout, the Continental two-place tandem pusher, a Curtiss Triplane with side-by-side seating, the familiar Curtiss J. N. tractor, and a small Anzani-motored tractor built by an employee of the L. W. F. Co., showed a great range in types. The Berckman Scout, equipped with a G. V. Gnome, is painted with a peculiar form of camouflage in the form of light blue and green background upon which square and oblong spots of many colors are arranged at regular intervals, on the body and surfaces. Its speed. agility and remarkably quick climb are not surprising when one closely examines the design and construction details which were worked out to attain such results.

Among the passengers carried by Acosta and by Petre were Andie Surini, of the Lawson Co., in Wisconsin, John F. McMahon, and H. P. Keane of the Hydrerocraft Co., who flew with Petre to an altitude of 5,000 feet.

The speed of the Continental pusher was again evident when it was raced by Acosta against Petre in a Curtiss J. N. Although the Continental has a 135 H. P. motor while the Curtiss is rated at 100, the races proved exciting, especially to the passengers, when the machines passed one another with a close margin between. At another time, the J. N. was pursued by the Berckman Scout, sneaking under its tail and suddenly appearing along side of the slower machine, then stalling, diving and flopping over, as though falling out of control, but all the while skilfully guided by Acosta, whose easy landings after these mancuvers drew favorable comment for the pilot and the machine.

187 Tons of Rubber for Goodyear

Akron.—Recently one of the largest shipments of crude rubber ever assigned to an American firm came across the Pacific from Singapore, India, to Seattle Wash. This shipment comprises 25,000 cases of plantation rubber weighing 187 tons and valued at nearly $3,000,000. It was consigned to the Goodyear Tire & Rubber Co.

Before the war American manufacturers received their crude rubber supply via London, as England controlled the rubber plantations and insisted on distribution from London. However, the Suez Canal is now closed to American merchant trade and the Pacific Ocean presents the only open waterway. The amount of this trade is rapidly increasing and it is stated that during the month of August $5,000,000 worth of crude rubber business was handled in Seattle alone.

Hartley Aircraft for Rock Island

Rock Island.—Removal of the Hartley Aircraft Co., Detroit, Mich., to Rock Island will take place as soon as quarters can be obtained here. Temporary offices have been opened at 1607 Second Avenue, and models of the various kinds of aircraft are on display. The company was organized several years ago.

Rubber Association to Study Aeroplanes

Akron.—At a meeting of important men of the Rubber Association of America with H. S. Firestone, president of the Association, present, a resolution was passed to appoint a committee to determine the manner in which the association could aid the Government in war. It is the aim of this association to study the construction and utilization of aircraft in large numbers and to act in accord with any conclusion derived by this committee.

Council of War for Country

Washington.—At a meeting of the Council of National Defense, Nov. 27, action was taken to bring about co-ordination of the war-making activities of the Government. A joint weekly conference of the Council of National Defense and Secretary of the Treasury McAdoo, Edwin N. Hurley of the Shipping Board, Food Administrator Hoover, Fuel Administrator Garfield, Chairman Daniel Willard of the War Industries Board and Director Gifford will be present. This co-ordinates the Council of National Defense, composed of Secretary of War Baker, Secretary of the Navy Daniels, Secretary of the Interior Lane, Secretary of Agriculture Houston, Secretary of Commerce Redfield and Secretary of Labor Wilson with the men mentioned.

This means that we will now have a war council, so to speak, and that the country's resources will be used in a more intelligent manner and that there no longer will be any such lack of co-ordination as will bring about the haphazard orders that were originally issued and which were contradictory between departments—for example, such an order as Priority Order No. 2, which conflicted with various other departments in the Government work.



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One of the drafting rooms of te British Air Board, which gives an idea of the magnitude of this organization. British official photograph.

Capt. W. Strother Smith to Speak in Philadelphia

Captain W. Strother Smith, U. S. N., chief of the Bureau of Invention and Research, repreSeting the Navy Department and the Naval Consulting Board, will deliver a lecture at the Manufacturers' Club on Monday evening, December 10th, at 8:15, under the joint auspices of the Engineers' Club, the Aero Club of Pennsylvania and the Philadelphia Manufacturers' Club.

Steinmetz to Lecture at Franklin Institute

Joseph A. Steinmetz, A. S. M. E., S. A. E., president of the Aero Club of Pennsylvania and a member of the Submarine Defense Committee, will address a meeting of the Franklin Institute, Philadelphia, where his subject will be "Offensive Against the Submarine."

Pruden to Open New York Office

The C. D. Pruden Company, manufacturers of "Prudential" Portable Galvanized Steel Buildings, Underwriters' Hollow Metal Windows and Kalamein Doors and Windows, with main office and factory at Baltimore, Md., will open a general sales office for their products on December 1st, 1917, at Room 806-807 in the Wallace Building, 56-58 Pine Street, New York City. The office will be in charge of Leigh Pruden, Vice-president of the company.

Mexico Sending Special Commission to Aero Show

A prominent import and export house of New York City has leased space at the Pan-American Aeronautic Exposition for the purpose of exhibiting a Mexican made aeroplane, propellers and accessories.

The Mexican Government is sending a special commission for the exposition to remain throughout the entire week.

Fahrig Metal Has New Factory

The Fahrig Metal Co., of 34 Commerce Street, New York, makers of Fahrig Anti-Friction Metal, which is extensively used for bearings of truck, aeroplane and other high-grade gasoline motors, have opened another plant which will double the production of Fahrig Metal. The new equipment will be in operation early in December, so their customers are assured of prompt deliveries as in the past.

A Correction

In a recent report of the proposed activities of the Society of Automotive Engineers' annual dinner, we stated that Mr. Charles M. Manly, who has been nominated for council membership in the S. A. E., was vice-president and chief engineer of the Curtiss Aeroplane Co. This should have stated that he was the chief inspection engineer of the Curtiss Aeroplane Co.

The Silvex Company Reorganized and Reincorporated

The Silvex Company of Bethlehem, Pennsylvania, manufacturers of Bethlehem Spark Plugs and other automotive accessories have announced the formation of a new corporation under the Laws of the State of Delaware, capitalized at $2,000,000 which will be divided equally in an issuance of $1,000,000 common and $1,000,000 preferred stock. The new board of directors includes: E. H. Schwab, president; J. H. Ward; E. B. Thurn; W. M. Davidson; and W. H. Lumpkin, all of Bethlehem. This company will shortly move into its new quarters—a modern concrete and steel factory that has been outfitted throughout with new machinery, deliveries for which were contracted for a year back.

It is reported that the increase in capital and facilities has been necessitated by demand for this company's products—particularly spark plugs for use in the various types of aviation motors now being developed.

NAVAL and MILITARY AERONAUTICS

Binoculars, Telescopes, and Spyglasses Needed By Navy

The Council of National Defense has issued the following circular addressed to State councils:

The Navy is in need of binoculars, spyglasses, and telescopes. Its supply of lenses in the past has come chiefly from France and Germany, and American resources are inadequate to fill the present greatly increased demand. In this emergency the Navy counts upon the American public to contribute its stock of privately owned observation glasses with the same generosity that has marked its donations of sweaters, mufflers, and other articles of comfort for sailors.

Nobody should hesitate to send glasses because they are old, for old lenses are often of good quality. The Navy Department will repair instruments that are out of conditon, provided the glass is satisfactory.

In order to conform to the Government policy of not accepting donations the Navy Department will pay $1 for each binocular, spyglass, and telescope accepted. The glasses should be tagged with the owners name and address and forwarded direct to Hon. Franklin D. Roosevelt, Assistant Secretary of Navy, care of Naval Observatory, Washington, D. C. They will be promptly acknowledged, and those not available will be returned.

Soldiers Forbidden to Accept Honors

American soldiers in France may not be permitted to accept the French War Crosses awarded to them for heroism in battle. Secretary Daniels has already declined to permit the British Government to decorate seamen for distinguished service in the anti-submarine patrol. Secretary Daniels considers the acceptance of such recognitions of heroism a violation of the Constitution.

Ouimet Seeks Air Commission

Francis Ouimet, the golf star, now in training at Camp Devens, Ayer, Mass., has made application for aviation service. Standing behind a "bunker" evidently does not appeal to Mr. Ouimet.

Special Orders 266

First Lieut. George W. Beeler, Medical Corps, National Guard, is relieved from his present duties and assigned to the Aviation Section, Signal Corps, to Seattle, Washington, to the officer in charge, physical examining unit, Aviation Section, Signal Corps, for assignment to duty as medical member of examining board and recruiting officer and by letter to the Chief Signal Officer of the Army.

By direction of the President, First Lieut. Beny Rosaler, S. R. C., is honorably discharged from the Signal Reserve Corps of the Army, to take effect this date.

Major William C. Ocker, Signal Corps, is rated as a junior military aviator under the provisions of paragraph 6 of the Act of Congress approved July 24th, 1917, with rank from November 2, 1917.

The following named Medical Reserve Corps are relieved from duty at the places specified and will proceed to Portland, Oregon, reporting in person to Colonel Brice P. Disque, Signal Corps, Yeon Building, for further instructions and assignment to squadrons now being organized and by letter to the Chief Signal Officer, United States Army, Washington D. C.: Capt. John C. Staley, Signal Corps, Aviation School, Fort Worth, Texas; First Lieuts. George H. Ramsey, Wilbur Wright Field, Fairfield, Ohio; Carlos C. Rozelle, Wilbur Wright Field, Fairfield, Ohio; Magnus I. Seng, Wilbur Wright Field, Fairfield, Ohio; Joel E. Toothaker, Wilbur Wright Field, Fairfield, Ohio.

The commandant, Medical officers' training camp, Fort Benjamin Harrison, Indiana, will assign 25 officers of the Medical Reserve Corps, to the Aviation Section, Signal Corps, and direct them to proceed to Portland, Oregon, reporting in person to Col. Brice P. Disque, Signal Corps, Yeon Building, for further instructions and assignment to squadrons now being organized.

By direction of the President the following named officers are detailed for service and to fill vacancies in the Signal Corps: Capts. John W. Simons, Jr., 1st Infantry; Stanley L. James, 27th Infantry.

By direction of the President, First Lieut. Jacob Greenfield, S. R. C., is honorably discharged from the S. R. C. of the Army, to take effect this date.

Leave of absence for eight days is granted First Lieut. George Brown, Jr., Aviation Section, S. O. R. C.

Special Orders 267

First Lieuts. James E. Lentz and Ralph A. Deacon, S. R. C., are assigned to active duty and will report in person to the commanding officer, Army Balloon School, Fort Omaha, Nebraska, for assignment to duty.

First Lieut. Urey G. Davis, Medical Reserve Corps, is relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Indiana, to Morrison, Va., to duty with the Aviation Section, Signal Corps.

First Lieut. Vincent Kerens, Aviation Section, S. R. C., is assigned to active duty and will proceed from Washington, D. C., to Kelly Field, South San Antonio, Texas, for assignment to duty.

Capt. Frank T. Coffyn, Aviation Section, S. R. C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from October 2, 1917.

First Lieut. David Heald, Aviation Section, S. R. C., is assigned to active duty, reporting to the Chief Signal Officer of the Army in person for duty.

First Lieut. Maurice Blumenthal, Aviation Section, S. R. C., is assigned to active duty with station at Garden City, Long Island, New York.

First Lieut. George M. Comey, Signal Corps, will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, New York, for assignment to duty.

The following named officers of the Medical Reserve Corps are relieved from duty at the reorganization camp, Syracuse, N. Y., and proceed to Mineola, Long Island, New York, reporting to the commanding officer, Aviation Section, Signal Corps, Hazelhurst Field, for duty: Capt. John W. Lee; First Lieuts. Earl H. Eaton, Victor P. Gene, Laurent G. Feiniet, George M. Lochner, Ward F. Seeley.

The following named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Indiana, and proceed to Fort Omaha, Nebraska, reporting to the commanding officer, United States Balloon School, with Aviation Section, Signal Corps, for duty: First Lieuts. Wayne R. Beardsley, Granville Eastham, Charles R. Elfers, Frederick L. Darrow, Paul F. Davidson.

A board of officers to consist of—Major John W. Butts, Aviation Section, Signal Corps; Major Arthur G. Coumbe, Medical Reserve Corps, and Capt. William P. Willetts, Aviation Section, Signal Reserve Corps.

Twelve Plattsburgers Get Aviation Rank

Plattsburgh.—Twelve men were commissioned and sworn in the Aviation Section, Signal Officers' Reserve Corps. They are:

Edward Hubert Litchfield, of No. 8 East Sixty-fifth street, as Major; Lewis Spencer Morris, No. 47 East Sixty-seventh street; Charles Higgins, New Haven, Conn.; Charles W. Alexander, Waltham, Mass., as First Lieutenants; Richard Stockton Jannopoulo, No. 15 East Thirty-fifth street; Robert Crosbie, Dorchester, Mass.; Theodore Augustus Fritchey, Jr., No. 24 Thomas street; Benjamin Martin Edgerton, Richmond Hill, L. I.; Samuel W. Oppenheimer, No. 723 Eastern Parkway, Brooklyn; Clinton A. Reed, Manchester, Mass.; Geoffrey Carson Maxwell, Baltimore, Md., and Carl Edward Siebecker, Scranton, Pa., as Second Lieutenants.

Special Orders 268

Second Lieut. Roger L. Cudworth, Aviation Section, S. R. C., will report in person to the Chief Signal Officer of the Army for duty in the concentration division of his office.

Capt. Benjamin C. Robinson, Signal Corps, will proceed to this city and report in person on November 20, 1917, to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. David L. Webster, Aviation Section, S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Capt. Leonard H. Johnson, Aviation Section, S. R. C., is assigned to active duty reporting in person to Chief Signal Officer of the Army for duty.

First Lieut. Frederick E. Kurz, Aviation Section, S. R. C., is assigned to active duty at Morrison, Virginia.

Capt. Edward G. Lowry, Aviation Section, S. R. C., is assigned to active duty, reporting to the Chief Signal Officer of the Army in person.

Capt. Andrew G. C. Sage, Aviation Section, S. R. C., is assigned to active duty, reporting in person to the Chief Signal Officer for assignment to duty.

Second Lieut. Don. W. Thomas, Aviation Section, Signal Reserve Corps, is assigned to active duty, reporting in person to the Chief Signal Officer for assignment to duty.

Capt. John Howry, Signal Corps, will proceed to this city, reporting in person to the Chief Signal Officer for assignment to duty.

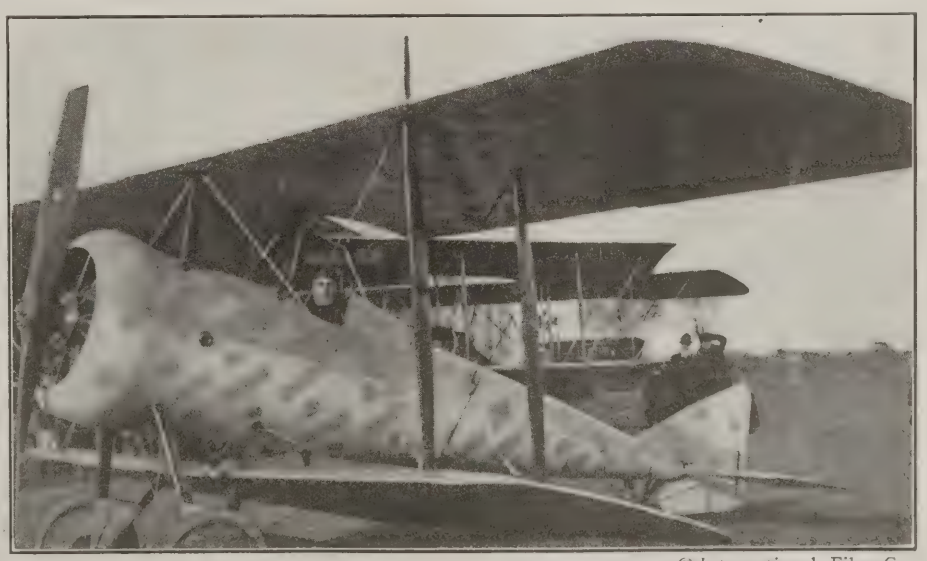
First Lieut. Doyen P. Wardwe, S. R. C., is assigned to active duty, reporting in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, New York, for duty.

First Lieut. Alfred M. Henderson, S. R. C., is assigned to active duty, proceeding to Camp Alfred Vail, New Jersey, reporting to the commanding officer for assignment to duty.

Special Orders 269

Second Lieut. Roger L. Cudworth, Aviation Section, S. R. C., will report in person to the Chief Signal Officer of the Army for duty in the concentration division of his office.

Capt. Irving Deemd, S. R. C., will report at Camp Sherman, Chillicothe, Ohio, from Camp Funston, Fort Riley, Kansas, reporting in per-



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The first camouflaged aeroplane seen in America—the speed scout constructed by the C.-E. Aeroplane Co. Major Cushman A. Rice in the pilot seat. Photo passed by censor.

son to the commanding general, 83rd Division, for the purpose of organizing the 317th Field Signal Battalion.

Capt. Benjamin C. Robinson, Signal Corps, will proceed to this city, report to the Chief Signal Officer on November 20th, 1917, for assignment to duty.

First Lieut. David L. Webster, Aviation Section, S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer for duty.

Capt. George B. Walbridge, Ordnance Reserve Corps, is assigned to active duty. He will take station at Washington, D. C., reporting in person to the Chief of Ordnance.

First Lieut. Frederick E. Kurz, Aviation Section, S. R. C., is assigned to active duty and will report to Morrison, Va., aeronautical concentration camp for duty.

Capt. Frank E. Smith, Aviation Section, S R. C., to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Charles Ray Vincent, Aviation Section, S. R. C., is ordered to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

Col. James B. Allison, Signal Corps, is relieved from further duty at the Presidio of Monterey, California, and will proceed to Washington, D. C., for duty.

The assignment to active duty by the Acting Chief Signal Officer of the Army of Captain Joseph H. Bean, Signal Corps, on Oct. 31, 1917, with instructions to report to the Chief Signal Officer for duty in his office is approved and confirmed.

Capt. Donald B. Sanger, Signal Corps, is relieved from duty at the Presidio of Monterey, California, proceeding to Fort Leavenworth, Kansas, for assignment to duty.

Major Walter H. Frank, Signal Corps, will proceed to Ellington Field, Houston, Texas, for assignment to duty.

First Lieut. John Frakes, Aviation Section, S. R. C., is assigned to active duty and will report in person to the commanding officer, School of Military Aeronautics, Champaign, Illinois.

The assignment of the following named officers of the Aviation Section, S. R. C., on November 7, 1917, to active duty nad orders concerning them as of that date is announced: Second Lieut. Charles E. Karasek, Aviation Section, S. R. C., on temporary duty at the following places: Mount Clemens, Mich.; Fairfield, Ohio; Rantoul, Illinois; Memphis, Tenn.; Fort Sill, Okla.; Wichita Falls, Texas; Waco, Texas; San Antonio, Texas; Houston, Texas; Lake Charles, Louisiana, to Washington, D. C., reporting on arrival to the Chief Signal Officer for duty, on completion of the temporary duty.

Examining Board Called

A board of officers to consist of Maj. James Prentice, Signal Corps; Maj. Frank M. Kennedy, junior military aeronaut, Signal Corps; Maj. Harold Geiger, Aviation Section, Signal Corps; Capt. Francis H. Poole, Medical Reserve Corps; and First Lieut. Frank W. Scott, Medical Reserve Corps, is appointed to meet at Fort Omaha, Neb., at the call of the senior member of the board, to pass upon the fitness to hold their commissions of such officers as may be ordered before the board.

Special Orders 272

First Lieut. Austin E. Gibson, is assigned to active duty and will report in person to the commanding officer, Aeronautical Concentration Camp, Garden City, Long Island, New York for assignment to duty.

Lieut. Col. James E. Fechet, Aviation Section, Signal Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from October 5, 1917.



Lieut. Gen. Sir David Henderson, Director-General of Military Aeronautics in Great Britain.

Sergt. Benjamin H. Adams, Aviation Section, Signal Corps, Chanute, Field, Illinois, is announced as on duty requiring him to make frequent and regular aerial flights from September 11, 1917.

First Lieut. Joseph H. Pinter, S. R. C., is assigned to active duty and will proceed to New York, New York, and report in person to the department signal officer, Army Building, for duty with the 413th Telegraph Battalion (Railroad).

First Lieut. Stanley J. Halle, Aviation Section S. R. C., is assigned to active duty and will proceed to Washington, D. C. reporting to the Chief Signal Officer of the Army for duty.

First Lieut. Thomas A. Willson, S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report to the Chief Signal Officer of the Army for duty.

Second Lieut. Edward K. McCloskey, Signal Rerserve Corps, is assigned to active duty and will proceed to New York, N. Y., reporting to department signal officer, Army Building, for duty with the 413th Telegraph Battalion (Railroad).

First Lieuts. Philip G. Kemp, and Herbert Marcus, S. R. C., are assigned to active duty and will report to the commanding officer, Chanute Field, Rantoul, Illinois, for assignment to duty.

Second Lieut. Donald S. Bixler, S. R. C., is assigned to active duty and will proceed to New York, N. Y. and report in person to department signal officer, Army Building, for duty with the 413th Telegraph Battalion (Railroad).

Capt. Charles W. Cobb, Aviation Section, S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Second Lieut. Francis B. Murray, Aviation Section, S. R. C., is assigned to active duty and will proceed to Garden City, Long Island, New York and report in person to the commanding officer for duty with a squadron.

Second Lieut. John W. Rogers, Aviation, Section, S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. John F. Merrick, Aviation Section, S. R. C., is announced as on duty requiring him to participate regularly and frequently in aerial flights from September 17, 1917.

The following named officers of the Aviation Section, S. R. C., are announced as on duty in aerial flights from dates indicated after their respective names: First Lieuts. Frank A. Dickman, Oct. 11, 1917; Frederick M. Murphy, Oct. 3, 1917; Capt. Wm. F. Gauss, S. R. C., is ordered to join the Expeditionary force.

First Lieut. Byron R. Switzer, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Selfridge Field, Mount Clemens, Mich, for duty.

First Lieut. John Dolan, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Ellington Field, Houston, Tex., for duty.

Second Lieut. Joseph M. Dawson, Signal Corps, is assigned to active duty and will proceed to Washington, D. C., and report to the Chief Signal Officer of the army for duty. The travel directed is necessary in the military service.

First Lieut. Fred F. Pepperdine, Signal Corps, is assigned to active duty and will proceed to Chicago, Ill., and report to the department signal officer for duty. The travel directed is necessary in the military service.

Second Lieut. Cavio F. Sileo, Signal Corps, is assigned to active duty and will proceed to Little Silver, N. J., and report to the commanding officer, Camp Alfred Vail, for duty. The travel directed is necessary in the military service.

First Lieut. Alfred C. Pickells, Signal Corps, is assigned to active duty and will report to the commanding officer, Fort Oglethorpe, Ga., for duty with the 7th Field Battalion.

Capt. Claude D. Uppington, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Love Field, Dallas, Tex., and report in person to the commanding officer, aviation repair depot, for duty. The travel directed is necessary in the military service.

First Lieut. John T. Gibbons, Signals Reserve Corps, is assigned to active duty and will report in person to the department signal officer, Eastern Department, Army Building, New York, N. Y., for duty.

First Lieuts. Richard D. Shelby and Herbert A. Wardle, Signal Reserve Corps, are assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for duty with a squadron.

The following-named first lieutenants, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report in person to the commanding officer, Army Balloon School, Fort Omaha, Neb., for duty: Herbert W. Ryan, Earl A. Yeager, Robert J. Keefe, Eldon P. Phillips, James H. Zipf, Oscar Roman.

First Lieut. Oliver B. Jacobs, Signal Reserve Corps, is assigned to active duty and will proceed to New York, N. Y., and report in person to the department signal officer, Army Building, for duty. The travel directed is necessary in the military service.



Direct front view of the Continental two-place pusher, Model K-B1, equipped with a Hall-Scott engine *Photo passed by the Censor*

Special Orders 272, 273

The following named officers of the Signal Reserve Corps, will proceed to Mineola, Long Island, New York, and report to the commanding officer, Hazelhurst Field, for duty: Capt. Eugene C. Braig; First Lieuts. Walter J. Bradshaw, Frank P. Gillick, Cecil Hewitt, Carl Grosse, Herbert G. Knight, James L. McGrath, James Hough, William T. Lynch; Second Lieutenants, Thomas A. Barrett, Jacob Mary, Augustus M. Lawrence.

A board of officers to consist of Major Walter Wynne, junior military aviator, Signal Corps, and one medical officer to be selected by the commanding general, Panama Canal Department, is appointed to meet at Fort Sherman, Canal Zone, for the purpose of examining applicants for commission in the aviation section, S. R. C.

By direction of the President, First Lieut. Samuel H. Shutt, S. R. C., is honorably discharged from the S. R. C., of the Army, to take effect this date.

First Lieut. Earl N. Findley, Aviation Section, S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Private Harold F. Davis, 108th Aero Squadron, Aviation Section, Signal Corps concentration Camp, Garden City, Long Island, New York, will be sent to Signal Corps Aviation School for non-flying Officers, Kelly Field, South San Antonio, Texas, for training, to arrive there December 8, 1917.

First Lieut. William R. Drexel, S. R. C., Aviation Section, is assigned to active duty and will proceed to South San Antonio, Texas, and report to the commanding officer, Kelly Field, for duty.

First Lieut. Everett R. Cook, Aviation Section, S. R. C., is assigned to active duty and will report to the commanding officer, aeronautical concentration camp, Garden City, Long Island, New York, for duty with a squadron.

First Lieut. Alonzo E. Flowers, Aviation Section, S. R. C., is ordered to active duty and will report in person to the commanding officer of that post, School of Military Aeronautics, Ithaca, New York, for assignment to duty.

Second Lieut. William H. Loughridge, Aviation Section, S. R. C., is assigned to active duty and will proceed to Portland, Oregon.

Capt. Dana Palmer, Signal Corps, is relieved from his present duties and will proceed to Kelly Field, San Antonio, Texas, and report for duty.

Major Augustine W. Robins, Aviation Section, Signal Corps, as on duty requiring him to participate regularly and frequently in aerial flights from November 12, 1917, is announced.

First Lieut. Hubert V. Hopkins, Signal Corps, will proceed to Portland, Oregon, and report to Col. Brice P. Disque, Signal Corps, for assignment to duty.

Special Orders 273 and 274

First Lieut. William N. Neidig, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.



Major-General Brancker, Deputy Director General of Military Aeronautics in Great Britain.

First Lieut. Russell E. Collins, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Post Field, Fort Sill, Oklahoma, for duty.

First Lieut. John J. Donnohue, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, New York, for duty with a squadron.

The following named officers of the Quartermasters Corps, National Army, are relieved from their present duties and will proceed to the aviation schools at the camps indicated after their names and report in person to the commanding officer for assignment to duty as quartermaster of these camps: Hubert W. Beyette, Rich Field, Waco, Texas; Joseph L. Palmer, Park Field, Willington, Tenn.; Oscar D. Brundidge, Love Field, Dallas, Texas; Conn Brown, Coll Field, Wichita Falls, Texas.

The following named officers of the Medical Reserve Corps, are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Ind., and will proceed to Montgomery, Ala., and report in person to the commanding officer, aviation mobilization camp, for duty with the Aviation Section, Signal Corps, and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: Capts. Edgar S. Bullis, Gustavus C. Darlington, Charles Dudley, Charles E. Long.

Under the provisions of Section 7, Act of Congress approved May 18, 1917, Master Signal Electrician Thomas J. Patterson, United States Army, retired (Signal Corps), care equipment division, office, Chief Signal Officer, this city, is assigned to active duty in his grade and will report to the officer in charge, Signal Corps General Supply Depot, for duty.

So much of paragraph 105, Special Orders, No. 262, War Department, November 9, 1917, as relates to First Lieut. George D. Durkee, Aviation Section, Signal Reserve Corps, is amended to read First Lieut. George R. Durkee.

First Lieut. Norris E. Pierson, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, aeronautical general supply depot and concentration camp, Garden City, Long Island, New York, for duty.

First Lieut. Morris E. Brown, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, aviation concentration camp, Middletown, Pa., for assignment to duty.

First Lieut. George G. Evans, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Camp Alfred Vail, Little Silver, New Jersey, for duty.

First Lieut. Robert Bowser, Signal Corps, will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty.

First Lieuts. Horace Orlady and Henry R. Swarzell, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, Wilbur Wright Field, Fairfield, Ohio, for duty.

First Lieut. Everett G. White, Signal Reserve Corps, is assigned to active duty and will proceed to Little Silver, New Jersey, and report in person to the commanding officer, Camp Alfred Vail, for duty.

Lieut. Col. Willard H. McCormack, Signal Corps, will proceed to Camp Greene, Charlotte, North Carolina, and report to the commanding general, 3d Division (Regular), for duty as signal officer of that division.

First Lieut. Francis W. Cowles, Aviation Section, Signal Reserve Corps, to the aeronautical general supply depot and concentration camp. Garden City, Long Island, New York with the squadron.

The action of the Surgeon General of the Army in placing First. Lieut. Ernest S. Colvin, Medical Reserve Corps on duty with the physical examining unit, Aviation Section, Signal Corps, Emory University, Atlanta, Georgia, on November 15, 1917, is confirmed and approved. Lieut. Colvin will report by letter to the Chief Signal Officer of the Army, Washington, D. C.

First Lieuts. Fay T. Bowen, Norman C. Spencer, and Harold A. Stone, Dental Reserve Corps, are relieved from duty at Camp Devens, Ayer, Massachusetts, and will proceed to Garden City, Long Island, New York, and report in person to the commanding officer, concentration camp and supply depot, Aviation Section, Signal Corps, for duty and by letter to the Chief Signal Officer, Washington, D. C.

The resignation by First Lieut. Walter G. Padeon, Signal Reserve Corps, of his commission as an officer in that corps is accepted by the President, to take effect this date.



French Brequet biplane, equipped with 200 h.p. motor, used for bombing and photography work. (Official French photo).

First Lieut. Herbert Trival, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass., for assignment to duty.

First Lieut. James H. McLean, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, New York, and report in person to the commanding officer, aeronautical concentration camp, for duty.

Major Henry M. Byllesby, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty on December 4, 1917.

First Lieut. Louis S. Dunbar, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Camp Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for assignment to duty.

First Lieut. Leonard W. Osborne, Signal Reserve Corps, is ordered to active duty and will proceed to Little Silver, New Jersey, and report in person to the commanding officer, Camp Alfred Vail, for assignment to duty.

First Lieut. Robert D. Hoyt, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Selfridge Field, Mount Clemens, Michigan, for duty.

First Lieut. Thomas C. McMahon, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the officer in charge aeroplane engineering department, Signal Corps, Lindsay Building, Dayton, Ohio, for duty.

Capt. Aloysius S. Fleming, Medical Reserve Corps, is assigned to active duty and will report in person to the officer in charge, physical examining unit, Aviation Section, Signal Corps, Minneapolis, Minnesota, for duty with the Aviation Section, and by letter to the Chief Signal Officer, Washington, D. C.

First Lieuts. William Henry, Harold R. Kelly, Earl F. Stewart, and Frank M. Bartlett, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Texas, for duty.

First Lieut. Edward P. Larned, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Kelly Field, South San Antonio, Texas, and report in person to the commanding officer for duty.

First Lieut. Edward Laughlin, Aviation Section, Signal Reserve Corps, is ordered to active duty and will take station at Washington, D. C., and report to the Chief Signal Officer for duty.

First Lieuts. Charles S. Keyes and Robert B. Dawkins, Jr., Aviation Section, Signal Reserve corps, are assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Illinois, for duty.

Second Lieut. William H. Loughridge, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Portland, Oregon, and report to Col. P. Disque, Signal Corps, for assignment to duty.

Second Lieut. Ernest Brown, Signal Corps, will proceed to South San Antonio, Texas, and report in person to the commanding officer, Kelly Field, for duty.

Second Lieut. Chester C. Ford, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to South San Antonio, Texas, and report upon arrival to the commanding officer, Kelly Field, for duty.

Major Evan E. Lewis, Aviation Section, Signal Corps, will proceed to Garden City, Long Island, New York and report upon arrival to the commanding officer, aeronautical general supply depot and concentration camp, for duty.

A board of officers to consist of: Capt. Madison Bentleym, Aviation Section, Signal Reserve Corps, and Capt. Franklin E. Cutler, Medical Reserve Corps, is appointed to meet at Cleveland, Ohio, for the purpose of examining applicants for commission in the Aviation Section, Signal Reserve Corps.

Paragraph 70, Special Orders 261, War Department, November 8, 1917, to First Lieut. Roy C. Ludick, Aviation Section, Signal Reserve Corps, is amended to read: First Lieut. Roy E. Ludick.

The following named officers of the Signal Reserve Corps are assigned to active duty:

Capt. Bernard C. Groh, Fort Leavenworth, Kansas.

First Lieut. Charles A. W. Heitchew, Leon Springs, Texas.

First Lieut. George Clark, Leon Springs, Texas.

First Lieut. Gill E. Pagan, Little Silver, New Jersey.

First Lieut. George A. Hoke, Fort Leavenworth, Kansas.

First Lieut. Albert Smith, Camp Meade, Annapolis, Maryland.

First Lieut. William M. Eaton, Fort Leavenworth, Kansas.

First Lieut. Thomas N. Mehan, Fort Leavenworth, Kansas.

First Lieut. Jay E. McLouth, Chillicothe, Ohio.

Second Lieut. William Moe, Hawaiian Department.

Second Lieut. William B. Patterson, Fort Leavenworth, Kansas.

Second Lieut. Stephen R. Ross, Fort Leavenworth, Kansas.

Second Lieut. Hubert A. Howson, Chillicothe, Ohio.

Second Lieut. Mclvin L. Smith, Fort Leavenworth, Kansas.

Second Lieut. Joe C. Youngblood, Fort Leavenworth, Kansas.

Second Lieut. Otto G. Morgan, Fort Leavenworth, Kansas.

Second Lieut. John J. Wray, Fort Leavenworth, Kansas.

Second Lieut. Harry C. Wait, Fort Leavenworth, Kansas.

Second Lieut. John W. Longshore, Fort Leavenworth, Kansas.

Second Lieut. Clement W. Lyons, Fort Leavenworth, Kansas.

Second Lieut. Carlisle M. Davidson, Fort Leavenworth, Kansas.

Second Lieut. Harold W. Evans, Chillicothe, Ohio.

Second Lieut. Frederick A. Davis, Fort Leavenworth, Kansas.

Second Lieut. William R. Sherwood, Fort Leavenworth, Kansas.

Standard Gasoline for Aircraft

Washington.—A standard grade of gasoline for use in the aviation engines of all the Allies was decided upon here last week at a meeting at which engineering representatives of England, France, Italy and the United States were present. The plan is to specify a new brand of gasoline for aeroplane use which will be a world standard. The particular grade to be adopted does not exist, but gasoline engineers are setting to work on the job and in a short time there will be evolved this new standard that will be used in all planes of the Allies.

This action was arrived at due to the severer conditions to be met with by aeroplane engines as compared with motor cars, trucks, motorcycles and motorboats. The aerplane encounters in any flight practically all possible ranges of temperature and pressure. To meet this a special fuel is needed. The new fuel is to be developed by the Bureau of Standards of this city, the Bureau of Mines, the Signal Corps and the Society of Automotive Engineers. All are to co-operate in carrying out investigations along lines laid down at the meeting.

At present the Allies are using ten different grades of gasoline for aeroplane engines, which is a disturbing factor not only on the battle-front but also with the refiners, who have to make different grades, and to the transport departments and storage departments that have to handle ten grades instead of one standard grade. The development of the standard aeroplane gasoline will be a big efficiency step and is but one more example of that necessary co-operation in winning the war that is taking place between France, England, Italy and the United States.

The standard gasoline, according to specifications laid down, will be a better fuel than used in automobiles today. The limiting factors of the new fuel were decided upon. The new standard gasoline will have a lower end point, perhaps 100 deg. Fahr. lower than many motor car fuels, and will also have a lower starting point. The percentage of volatility throughout the fuel will be greater than in present gasoline grades. The new gasoline will be such as to get the maximum quantity out of a gallon of crude oil, and yet give the lowest possible end point on the curve.

The development work will be carried out in the depression room of the Bureau of Standards, where it is possible to obtain practically the same atmospheric conditions as met by the aeroplane from the time it leaves sea level and rises to 22,000 feet altitude. In this room the air can be exhausted so as to give a mixture similar to that obtained at 15,000 feet or higher. Cold conditions equal to any temperature can be had at the same time.

This is the first time on record when engineers have set out to design a fuel to meet given conditions. The problems of lubrication under all conditions will be considered in conjunction with the work.

Dr. Durand, chairman of the Research Council of Aeronautics, presided and among those present were Capt. Pearson of the British Navy; Capt. Chablon of the French Flying Corps; Lieut. F. Bizanni of the Italian Royal Flying Corps; H. L. Horning, chairman of the Automotive Products Section of the Council of National Defense; C. Narramore, petroleum technologist of the Bureau of Mines; Dr. C. P. Dickinson of the Bureau of Standards; Dr. Dean of the Bureau of Mines; Wahner of the Bureau of Standards; Parish of the Signal Corps; Lieut. Col. Wright of the Navy; F. G. Diffin representing the Aircraft Production Board.

Ships and Aeroplanes Vital Need Say Returning Representatives

Washington.—Mr. Edward D. Taylor, one of the members of the Congressional Mission which has just returned from Europe, stated that the most valuable contribution that the United States can make to the Allies is aeroplanes.

The need for aeroplanes is more vital than the need for troops. Until we are further advanced on our ship-building program, Mr. Taylor and his colleagues of the Congressional Mission, believe that sending troops abroad in large numbers would be a hindrance rather than a help to the Allied cause, as it would still further decrease the per capita tonnage for food shipment. The increasing importance and scope of the work of aeroplanes makes our assistance in this field of decisive importance.



Interior view of the Gio Ansaldo & Company factory, Genoa, Italy, where the S. V. A. machines are built.



THE ITALIAN "MACCHI" FIGHTING FLYING BOAT

THE Macchi single-seater fighting aeroplane is one of the most efficient flying boats ever built. Owing to the fineness of its construction, its light weight, and high powered motor, it is able to ascend to an altitude of 13,000 feet in only 18 minutes. In a single-seater fighting machine quick climb is, of course, one of the important essentials of performance, although this adaptability to climbing rapidly is not generally associated with machines of the flying boat class.

Head resistance has been reduced to a minimum, especially in regard to the interplane bracing. The struts and interplane bracing is similar in principle to that employed in the French Nieuport scout—the single pair of V struts, the narrow lower plane, and the outline of the planes themselves bear a resemblance to the Nieuport. The Macchi is provided with steel tube overhang braces, because of the area extending beyond the interplane struts.

The overall dimensions of the machine are,—Span, 39'-4.7/16"; overall length, 27'-3"; overall height, 9'-10-1/16". There is a lifting surface of 301 sq. ft. The loading per sq. ft. is 6.85 pounds.

When empty, the machine weighs 1,510 pounds. When fully loaded to its gross weight of 2,060 pounds, the military load is distributed as follows: gasoline and lubricating oil, 265 pounds; pilot, 175 pounds; two Fiat machine guns, both firing forward, 110 pounds. Total weight of the useful load carried, 550 pounds.

Near the surface of the water the machine can travel at the rate of 112 miles an hour. In the first four minutes it can climb to 3,250 feet; eight minutes, 6,500 feet; twelve and one-half minutes, 10,000 feet; and in 18 minutes it reaches an altitude of 13,000 feet.

The engine is an Isotta-Fraschini 150 H.P. The loading of the machine is 11.8 pounds per brake horsepower. Sufficient gasoline and oil is carried for an air endurance of 3 hours.

The Isotta-Fraschini engine with which the Macchi boat is equipped is known as the V 4 B. This is a 6-cylinder vertical type with a nominal H.P. of 150 and a bench-test normal H.P. of 190 at 1,400 revolutions per minute. Bore, 5.2 inches; stroke, 7.1 inches. Overall dimensions of the V 4 B—length, 5'-0 5/16"; height, 3'-3 1-8"; width, 2'-3-15/16".

Carburetors, Zenith; magnetos, Marelli. The weight of the engine complete, dry, is 573 pounds. Its weight per b.h.p. is 3.01 pounds. Gasoline is consumed at the rate of 92.6 pounds per hour; consumption per b.h.p., 7.4 ounces. Lubricating oil is consumed at the rate of 8.82 ounces per hour; oil consumption per b.h.p., 0.7 ounces.



Side view of the "Macchi" flying boat, photographed while resting on the surface of the ice



The 150 H.P. single-seater "Macchi" flying boat fighter. Notice its steep climbing angle, 18°.

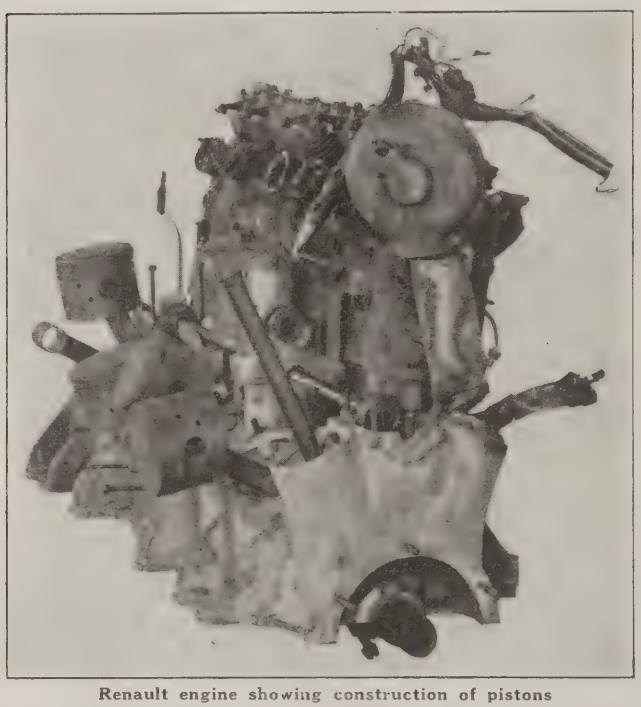
AVIATION ENGINE DEVELOPMENT

By E. H. SHERBONDY

PART II

Renault Engine

The first important peculiarity of the V-type twelve-cylinder Renault engine of 125 mm. bore and 160 mm. stroke is a small angle between the cylinders, only 47½ deg., which enables the body width to be considerably lessened, thus reducing the head resistance. The cylinders of this engine are almost a duplicate of the Mercedes design of steel cylinders, with the exception that the elbows in which the valves are inserted are not so carefully designed and the water-jacket is carried around only one side of the exhaust-valve stem, whereas in the Mercedes engine the water-jacket completely surrounds the exhaust-valve stem. It appears to be absolutely essential to cool the exhaust valve as much as possible, since preignition is likely to occur usually from one of three sources, the spark-plug, which is the arch offender, the exhaust-valve, or the center of the piston head. There are two valves for each cylinder 66 mm. (2⅝ in.) diameter. The valve port is 61 mm. (2 13/32 in.). The inlet to the elbow is 53 mm. (1 3/32 in.) in diameter. The valve stems are both 11 mm. (7/16 in.) diameter, with a head aproximately 5/32 in. thick and a 45 deg. seat ⅛ in. wide.



Renault engine showing construction of pistons

The end of the valve stem is threaded to carry the spring cup and lock nut. Each cylinder barrel and head is machined from a forged bar after which the intake and exhaust elbows are welded on and finally the pair of cylinders are encased in a jacket which is welded from three pieces of steel about 1/32 in. thick. The cylinder walls themselves are 3 mm. (7/64 in.) thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profile-milled out of steel. The flanges are screwed on the cylinders and welded and brazed on the intake and exhaust pipes. These cylinders have been through a fire as the engine was shot down, hence their mottled appearance, but they were originally beautifully enamelled on the outside.

The pistons are of cast iron and are the only heavily designed pieces in the engine. It certainly seems as though these could have been considerably lightened. The piston carries three concentric rings which are pinned at the ring gap and have a deep annual rib between the bosses. The pistons are also unusually short, only 95 mm. (9¾ in.) in length. The piston-pin is 38 mm. (1½ in.) diameter, and has a ⅛ in. wall and is locked with a single set screw and cotter pin. There are eighteen 11/32-in. holes drilled into the skirt, but these holes must have been drilled for oiling purposes, as they do not materially reduce the weight of the pistons, which is 1975 gm.

The connecting-rods are of the articulated type, and the short rod is alternately arranged from right to left cylinder from the front to the back of the engine.

The connecting-rods are made of B. N. D. steel, I-beam section, with a flange and web 2 mm. thick. The flanges are 26 mm. (1 3/64 in.) and the web is 34 mm. (1 11/32 in.) wide. In the short connecting-rod both ends of the rod are alike. The length of the rod is 300 mm. (11 13/16 in.). The rod cap is secured by means of three bolts, two of 11 mm. (7/16 in.) diameter and one of 14 mm. (9/16 in.) diameter.

The crankshaft is carried in four babbitt-lined bronze shells, which in turn are secured to ribbed-steel bearing caps.

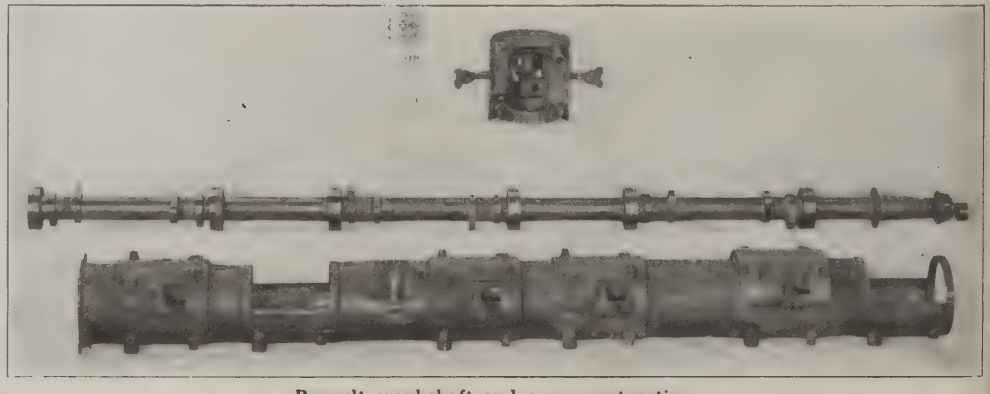
The bearing caps are locked in the top of the case by means of long U-bolts, such as are sometimes used on automobile spring-saddles. The crankshaft has a diameter of 60 mm. (2 23/64 in.) throughout with the exception of the propeller shaft-end, where the diameter is increased to 68 mm. (2 43/64 in.). The crankpins and main bearings are 72½ mm. (27 55/64 in.) long with the exception of the propeller-end bearing, which is 92 mm. (3⅝ in.) long. The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting-rod big-ends. The front end of the crankshaft is splined to mount the starting gear and accessory drive. The bottom half of the crankcase simply serves as an oil-pan and has a screen separating it into two partitions. The water-pump is mounted on the front of the engine from the bottom half of the crank chamber, and has an ingeniously designed double runner with double collecting chambers. The water is piped to either side of the engine through copper pipes, and rubber connections are interposed to prevent cracking of joints due to vibration.

The carbureter differs from the Mercedes only in that it uses a single float chamber instead of two. Two carbureters are mounted on either side of the engine and bolted to either side of the crankcase by means of long studs. The intake pipes, which are fastened by means of unions to the carbureter, are made of copper tubing 48-mm. (1 57/64 in.) diameter.

The carbureter has a pair of primary nozzles and a pair of secondary nozzles and an auxiliary air valve, which consists of an annual ring mounted concentrically with a venturi throat. It would seem that this auxiliary air valve was a dangerous construction to go up in the air with, as it is very likely to stick.

The oiling system is extremely simple. Oil is carried through cast ducts in the front and rear compartments of the crank chamber to the main bearings. It is also carried from these ducts through two copper tubes up to the overhead camshaft case and passes through the camshaft case and returns down through the distributing gearing case to the oil sump.

The valve gear is of elaborate, expensive design. The main scheme of the construction is to use a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages that form both the camshaft bearings and the rocker-arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 mm. (15/32 in.). The camshafts and the driving shaft are driven through straight bevel gears of 12½ mm. (½ in.) face. The



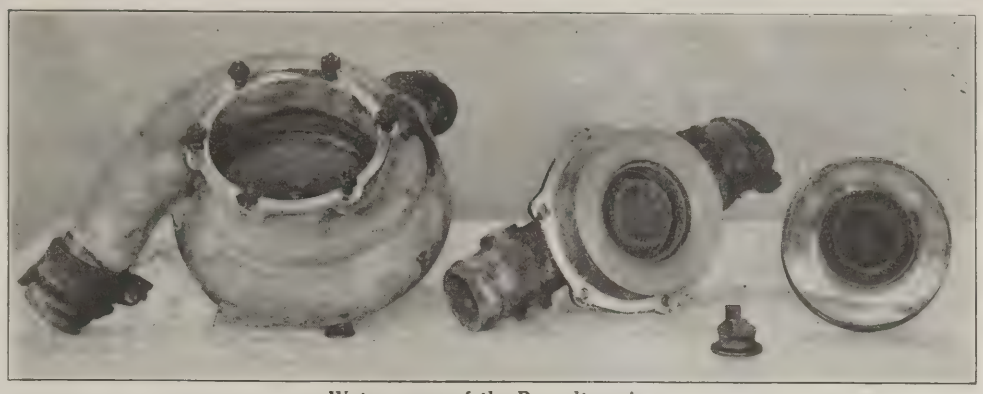
Renault crankshaft and case construction

inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allows their weight to be considerably decreased.

At first sight it would seem that the gearing in the Renault engine is a complicated and expensive one, but this arrangement turns out to be cheaper and much lighter than where a train of spur gears is used for driving magnetos and camshafts. The Peugot Company introduced the use of spur gears for overhead camshaft driving, and this construction has been copied by Sunbeam, Wisconsin and Packard. In a twelve or an eighteen-cylinder engine the gears necessary with this gearing arrangement form a maze of complications. The Rolls-Royce, Hispano-Suiza, Hall-Scott, and Christofferson use bevel gears for driving the camshaft. All these designs are more or less an imitation of the original Mercedes. A few of the imitators seem to have grasped the importance of operating the auxiliary shaft at high speed.

There are four magnetos mounted on the same axis, each pair being driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto drive-shaft. The magneto drive-shaft terminates at its forward end in the sleeve of a bevel gear, and is helically splined into the bevel gear so that when longitudinally displaced the shaft is also angularly displaced. This construction is costly, but is the best one the author has seen, since it avoids many connections to magneto breaker boxes, and also insures a spark of the same intensity, regardless of whether the ignition is advanced or retarded.

At the front end of the crankshaft is mounted an aluminum six-cylinder air-starting motor, which engages the crankshaft by an overrunning clutch. This air-starting motor has a single inlet and discharge valve for six cylinders, of the rotating disk type. A hand-starting gear and the starting magneto drive is also built integral with this starter.



Water pump of the Renault engine

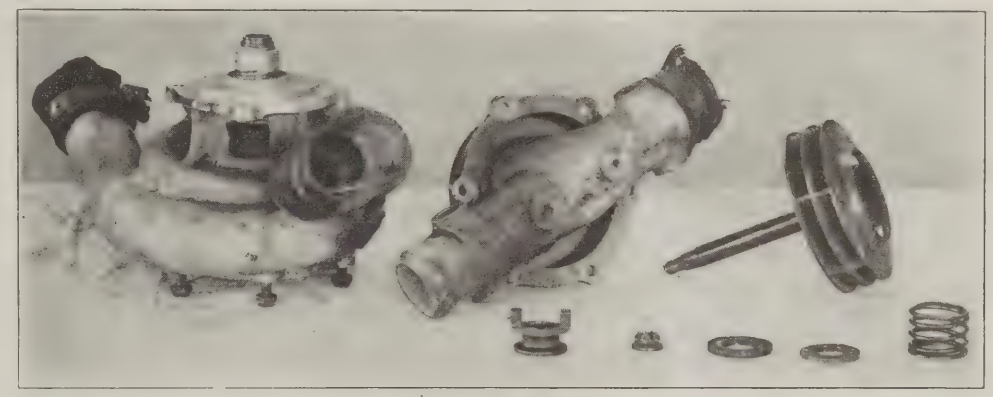
The Benz Engine

In the Kaiser Prize Contest for aviation engines a four-cylinder Benz engine, 130 by 180 mm. won first prize, developing 103 h.p. at 1290 r.p.m. The fuel consumption was 210 gm. per h.p. per hr. Total weight of the engine was 153 kg. The oil consumption was 0.02 kg. h.p. per hr. This engine was afterward expanded into a six-cylinder design, and three different sizes were built.

The accompanying table gives some of the details of weight and horsepower for the Benz engines:

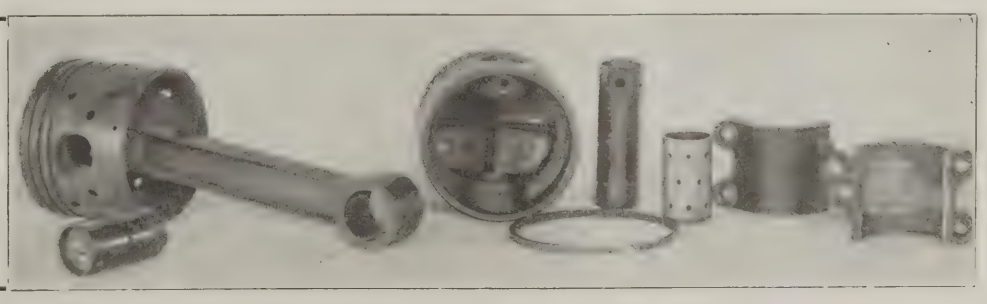
Engine type	FB	FD	FF
Rated horsepower	85	100	150
Horsepower at 1250 r.p.m.	88	108	150
Horsepower at 1350 r.p.m.	95	115	160
Bore, millimeters	106	116	130
Stroke, millimeters	150	160	180
Offset of cylinders, millimeters	18	20	20
Gasoline consumption, grams per hour	240	230	225
Oil consumption, grams per b. hp. per hour	10	10	10
Oil capacity, kilograms	36	4	4½
Water capactiy, liters	5½	7½	9½
Weight with water and oil but with two magnetos, fuel feeder and air pump, kilograms	170	200	245
Weight of engines, including water-pump, two magnetos, double ignition, kilograms	160	190	230
Weight of exhaust pipe complete, kilograms	4	4.8	5½
Weight of propeller hub, kilograms	3½	4	4
Price, including cooling radiator, marks	10,000	11,500	14,000

The Benz cylinder is a simple, straightforward design and is not particularly difficult to manufacture. The cylinder is of cast iron without a water-jacket and includes 45-dg. angle elbows to the valve ports. The cylinders are machined wherever possible, and at other points are hand filed and scraped, after which a jacket which is pressed in two halves is gas-welded on. The bottom and top of the cylinders become water galleries, and by this means separate water pipes, with their attendant weight and complication, are eliminated. Rubber rings held in aluminum clamps serve to conect the cylinders together. The cylinder walls are 4 mm. (5/32 in.) thick, and the combustion chamber is of cylindrical pancake form and is 140 mm. (5½ in.) diameter. The valve seats are 68 mm. (2 11/16 in.) diameter and the valve port is 62 mm. (2 29/64 in.) diameter.



Water pump Renault engine

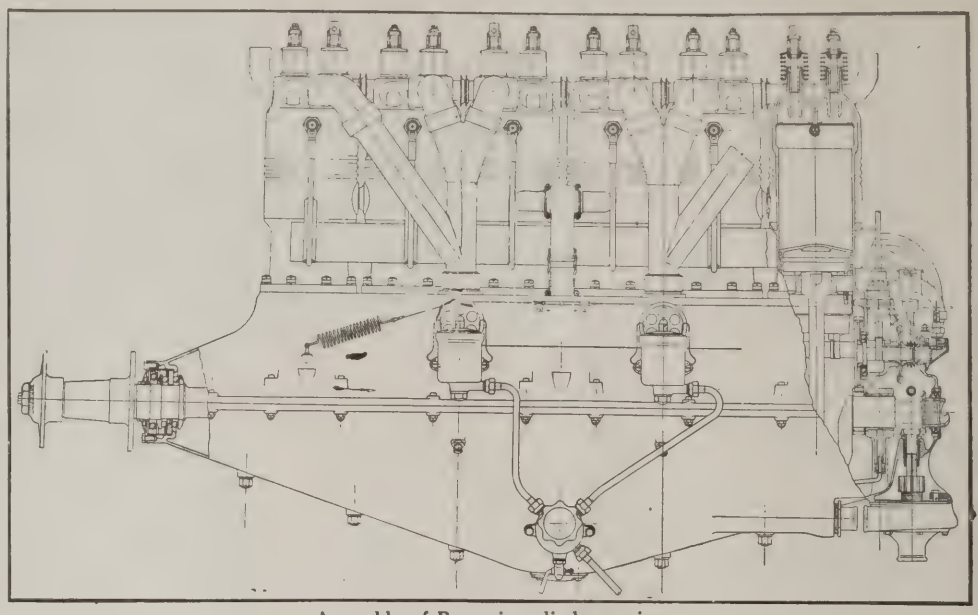
The passage joining the port is 57 mm. (2¼ in.) in diameter. In order to insert the valves into the cylinder the valve stem is made with two diameters, and the valve has to be cocked to insert it in the guide, which has a bronze bushing at its upper end to compensate for the smaller valve stem diameter. The valve stem is 14 mm. (9/16 in.) in diameter and is reduced at its upper portion to 9½ mm. (⅜ in.). The valves are operated through a push-rod and rocker-arm construc-



Renault piston construction

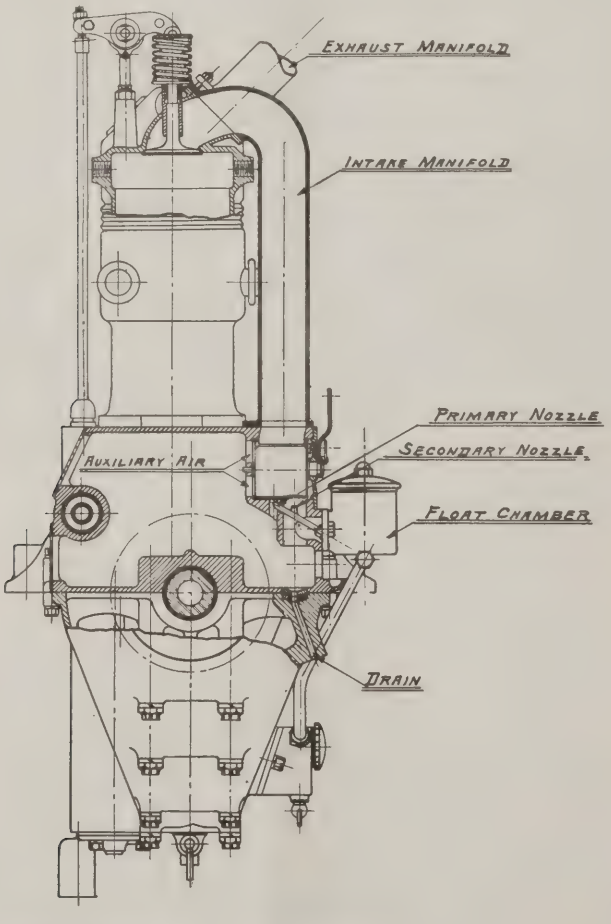
tion, which is exceedingly light. The rocker-arm supports are steels with enlarged heads to take a double-row ball bearing. A roller is mounted at one end of the rocker-arm to impinge on the end of the valve stem and the rocker-arm has an adjustable globe at the other end. The push-rods are light steel tubes of 11 mm. (7/16 in.) diameter with a wall thickness of ¾ mm. (1/32 in.) and have a hardened steel cup at their upper end to engage the rocker-arm globe stud and a hardened steel globe at their lower end to engage in the roller plunger.

The Benz camshaft has a diameter of 26 mm. (11/32 in.), and is bored straight through with a diameter of 18 mm. (23/32 in.). A spiral gear made integral with the shaft in about the center of its length drives the oil-pump gear. The cam faces are 10 mm. (25/64 in.) wide. There is also, in addition to the intake and exhaust cams, a set of half compression cams. The shaft is moved longitudinally in its bearings by means of an eccentric to put these cams into action. At the front end of the shaft is a driving flange, which is small in diameter and thin. The flange is 68 mm. (2 11/16 in.) diameter, 4 mm. (5/32 in.) thick, and is tapped to take six 6 mm. bolts. Total length of the camshaft is 1038 mm. (40⅞ in.) and it becomes a gun-boring job to drill a hole of this length.



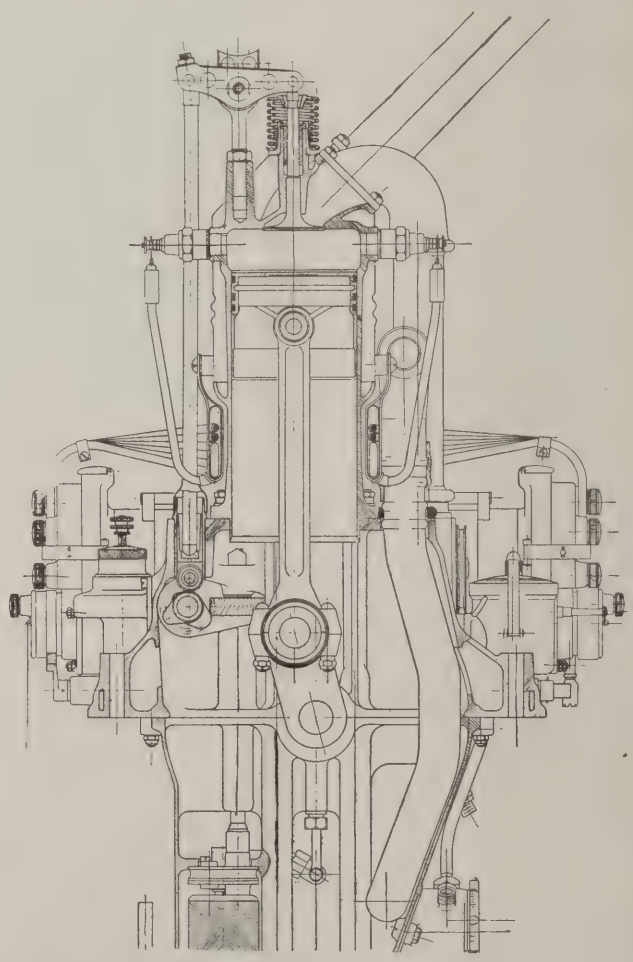
Assembly of Benz six-cylinder engine

The camshaft gear is 140 mm. (5½ in.) outside diameter. It has 54 teeth and the gear face is 15 mm. (19/32 in.). The flange and web have an average thickness of 4 mm. (5/32 in.). and the web is drilled full of holes. A gear serves to drive the magnetos and tachometer, also the air-pump. The shaft is made integral with this gear and has an eccentric portion against which the air-pump plunger roller impinges. The seven bearing crankshaft is finished all over in a beautiful manner and the shaft from the particular engine we have shows no signs of wear whatever. The crankpins are 55 mm. (2 11/64 in.) diameter and 69 mm. (2 23/32 in.) long. Through both the crankpin and main bearings is drilled a 28 mm. (1 7/64 in.) hole. The crankcheeks are plugged with solder and are also built to convey the lubricant to the crankpins. At the front end of the crankcheek there is pressed on a spur driving gear. Screwed on to the front end of the shaft



SECTION THROUGH CARBURETOR

170 H.P. BENZ AERO ENGINE



Cross section of Benz engine—through cylinder and through carburetor

tures, the vanguard of a large American balloon force which ultimately will be as complete as any other branch of the Army.

The work that this force will do will be invaluable. With the aeroplane spotters and photographers, it will complete the vast Air Service which it is expected will blind the German Army and prepare the way for the Artillery and Infantry to break up the German military resistance. Its minute-by-minute observations will head off all enemy surprises and will at the same time make it possible for American men and American munitions to secure the maximum of destruction on the other side of No Man s Land.

Few of us here realize that the big envelopes commonly ascend as high as 4,500 feet and that they stay for hours poised in mid-air to perform the responsible duties assigned them. Usually they ascent is made anywhere from 2½ to 4½ miles from the enemy's front-line trenches, depending on the power of his artillery, the direction of the wind, and the activity of the salient. In any case the observer has a circle of vision of about 8 miles, and is able to pierce far back into the enemy's lines. The most detailed and up-to-the-minute maps, the finest kind of field glasses, and instant communication with the ground make the balloonist a master of everything spread out before his gaze.

When the American troops are preparing to go "over the top" an unusually large number of balloons will be concentrated as secretely as possible in masked camps in order not to betray what is about to take place. At the appointed moment they will take the air and divide up every detail of the battle amongst them. Some will record the heavy-artillery fire, shot by shot; others will so to it that the work of demolition behind the enemy's lines is effective; others will guard against any reinforcements or traps.

As the troops go over they will check closely the German batteries, the shifting of the infantry, and the assembling of supplies. As the American forces advance the balloons will move forward also in unison with them along routes previously prepared. Observations for the barrage will be sent down repeatedly, so that it may move back and forth with the men and details sent so that the enemy's guns setting up the destructive counter barrage may be silenced.

To do this the American balloonist must know every detail of the enemy's land opposite him, for a mistake on his part may cost the lives of scores of men below. No new battery should open up across the lines without its locations being spotted on the detail map, the number and size of the pieces and their objective noted, and counter-fire preparations made against it. No new troops should move into the enemy trenches without being fully known, numbers as well as routes—difficult work all of it—for the German has many wily devices for simulating gun-fire and camoflouging movements.

And the work also will not be without danger and difficulties, though the chances of a fatal outcome are not large. If it is not a swooping airman bent on setting the big gas bag on fire, it may be a rain of shrapnel seeking the same object or of percussion shells, endeavoring to blow up the windlass below and set the big bag adrift in a wind blowing across the German lines. Naturally, every precaution in the way of protecting airmen and anti-aircraft guns are on hand, but even at that constant vigilance is essential.

Weather conditions also bring difficulties, though not so great as might be expected from a distance. Flying in thunderstorms is, of course, dangerous because of the lightning. Rainstorms appreciably add to the weight of the balloon and thereby decrease its ascending power, while heavy winds put a strain on the cable and considerable wear and tear on the envelope. Clouds are bothersome as a mask for lurking airmen, and fogs, if regular through the atmosphere, render, observation very difficult. Nevertheless, so essential is the news gathered by balloonists that they are sent up in all sorts and kinds of weather.

One of the most difficult and yet essential parts of the work is that of concealing the balloon "beds," especially from enemy airmen who like to hunt out the big envelopes when they are lying on the ground. "Beds" in the lea of a hill which obstructs artillery fire or in the deceptive shadows of a near-by wood offer a preliminary disguise, but beyond that "camoufleurs" are needed to exercise their highest skill.

Plans for all this work are now progressing at a gratifying rate. The American balloon program has been aided by the best and latest developments abroad, while manufacture presents but a few difficulties, owing to the resources of the big American rubber companies. The great need, as with all the air programs, is for men of the type and ability needed, men for officers' commissions as observers and men for the enlisted squadrons to do the delicate mechanical work necessary. The balloon section of the Signal Corps at Washington has already handled hundreds of letter applications and is ready to furnish the fullest details so that by next spring the American balloon force already in France may be increased to a size commensurate with the pressing needs of the American Army there.

Men who are being selected as observers, and who will all be commissioned as officers, should have physical endurance, acute vision, an appreciation of distances and localities, and, above all, a sense of responsibility and thoroughness in keeping with the importance of the work assigned to them. They may be somewhat older than aviators—preferably from 25 to 35—and of somewhat less severe physical requirements. A special training is given in winds, military observation, meteorology, and balloonng before a cadet is given his officer's commission and his post above the trenches in France, in order that the high standards prevailing throughout the Air Service generally may be upheld.

For the enlisted men who will form the squadrons, gas-works employees, rope riggers, cordage workers, and mechanicians are especially fitted. The number of men trained through their civilian occupations to do this delicate and highly specialized work is limited, indeed, and the difficulty of establishing contact with them is great. Nevertheless, the forces are being brought together with gratifying rapidity and give every promise of becoming an efficient part of the air establishment which is to help the Allies blind the German forces in France.

Army Balloons Make Life Exciting Out in Nebraska

Omaha.—Every day is circus day here. The reason? The United States army balloon school, the only one in the United States, as Omaha proudly explains, is located at Fort Omaha, within the city limits.

Citizens hurry through their meals and rush out upon the housetops to scan the horizon for the huge gas bags that float over the city day and night—no one ever knows just when, for the goings and comings are a military secret. Sundays a large par cent of the population hies itself to Fort Omaha, there to hang over the fence and watch the vaulting parachuters who till a few months ago were staid business men and scholarly university students.

When the war was declared last spring Uncle Sam looked around his domain for balloonists, for the French and British told him he'd have to have a few in his new venture. All along the battle front, they said, the kite balloons floated, just above and behind the artillery lines, and their occupants directed the expensive artillery fire.

Fort Omaha Selected

Well, for a while Uncle Sam was up against it. He scratched his head and thought hard, trying to locate a few military gentlemen who knew something about ballooning. Some one reminded him that at Fort Omaha, Neb., some mildly insane (as they thought then) army men had prevailed upon him to build a balloon house and hydrogen plant and buy them a balloon or two to play with some years ago. Post haste he sent for his army directory and found Captain Charles De Forest Chandler, an amateur balloonist, was then commanding the post.

"Open up a balloon school," commanded Uncle Sam, and then it was Captain Chandler's turn to scratch his head. Not half a dozen officers in the United States army knew what made a balloon go up and what made it come down. Captain Chandler himself knew more about the aerial game than any other army man in the country. On the wings of the wind he sped to New York and persuaded the most skilled civilian balloonist in the country, if not in the world, to join him.

Leo Stevens, the man he brought back to head the instruction force at Fort Omaha, needs no introduction to the public. The greatest parachutist in the world, probably with no equal in ballooning anywhere, he sold out his balloon manufacturing business, made the government a present of the patent of his new parachute, which works automatically and has never failed, rolled up his sleeves and began turning out balloon pilots.

The Aero Club of America gave its assistance and mapped out the course for pilots. Since that day several hundred skilled balloon pilots have been turned out at Fort Omaha, some of whom are now at the front, it is thought. No one knows when they come or go, but the old faces disappear and new ones come in continually.

Promotions in Order

Captain Chandler was speedily promoted and is now lieutenant colonel because of his work in organizing and directing the school. He was soon called to Washington and is now "over there" somewhere. So is Major Frank Lahm, who took his place and commanded the fort till he broke his leg and retired awhile, when he, too, went to France to observe balloonists in action.

Major Lahm was one of the real balloon experts in the army. Winner of the James Gordon Bennett Cup in the international races, pilot of a balloon in the Wellman dash to the pole and hero of other adventures, he knew his ground. by Major H. B. Hersey, inspector for the Weather Bureau, his partner in the polar dash, a major in the Rough Riders under Colonel Roosevelt, an explorer and a scientist. He still heads the fort.

These men and Leo Stevens soon turned out ten expert pilots, men who knew nothing of balloons previously. They in turn taught hundreds of others. They are Majors Bower, Prentice, Daggett, Boettcher, Hardin and Paegelow, Captains Jowett, Vaughn, McElgin and Davidson.—*New York Herald.*

Aviator Rescued from Drifting Seaplane—Has Long Record of Service

Frank J. Brady, one of the three aviators rescued from the hydro-aeroplane, which drifted for many hours off the coast of France, has a record of heroism behind him. After distinguished service with the 14th Cavalry, which saw service in Mexico, he joined the Salvage Corps of the Newark Fire Department. Early this year he won a gold medal for valor in recognition of his rescue of a fireman who had been overcome by chemical gases. An explosion of an ammonia tank had already caused the loss of the lives of eight men, but this did not deter Brady from accomplishing the rescue, despite the strong ammonia fumes.



Inflating a French kite balloon from cylinders on the field

FOREIGN NEWS

CHINA

One of the members of the mission being sent to the United States is Tom Gunn, the Chinese aviator. He has successfully organized the Chinese aviation corps and is director of the aeronautic department of his government.

Because of his activities in behalf of Sun Yat Sen, the Yuan Shi Kai government placed a price of $5,000 on his head in 1914. He was at that time engaged in establishing a field in Manila for the purpose of training aviators for the revolutionary army.

FRANCE

An Associated Press dispatch dated November 29th states that "A substantial vanguard of the great army of American aviators which eventually will operate in France has arrived near the front."

Advices received from General Pershing by the War Department state that Private Raymond H. Runner, attached to the provisional aero squadron of the Signal Corps died on November 24th from injuries received in the accidental fall of an aeroplane.

The Germans, who have used toy balloons for the purpose of sending unofficial communications to the allied troops have found another use for these balloons. The little red-colored messengers frequently also carry germs intended to breed epidemics, and now no soldier is permitted to touch one of these balloons until it has been subjected to a searching medical examination.

GERMANY

A super-Gotha aeroplane is now under construction for heavy bombing work. Its motive power consists of four 260 h. p. motors and carries a crew of five men and a fuel supply for ten hours, according to a report recently received. The weight of the machine is approximately six tons and is so cumbersome and heavy that its speed falls below that of a raider.

Captain Baron von Richtofen, Germany's foremost aeroplane expert, expressed his contempt for American aerial preparation in a recent newspaper interview. He believes it impossible for America to collect a force of 20,000 trained pilots, for training is a slow process, involving many casualities. Our plans of shipping large numbers of machines for use in Europe, he stated, will be largely offset by the fact that at least 25% of the machines will be destroyed or damaged in shipment. Increased German production will overcome any effort which we may make.

The installation of wireless receiving outfits on German warplanes has, according to General Ardenne, greatly increased the efficiency of the German Air Service, for it permits the sending of instructions to machines while in flight, making it possible to send a machine where it is needed after finishing one aerial combat to another field of battle without loss of time for landing and forwarding of instructions.

Lieutenant Bothe, in addressing the German Aerial League, stated, according to a translation from *Der Motorwagen:* "In future wars it will be necessary to invade the enemy's territories by means of tens of thousands of aeroplanes, which by dropping hundreds of tons of explosives would destroy all industrial works, transport routes, etc., and thus delay the advance of the troops and impede preparations for offense or defense.

"The war would be won within the first few days of the declaration of hostilities by the Power or Powers which were thus able to throw in the largest weight of aerial 'frightfulness,' and thereby paralyze the fighting efficiency of its opponents before even a battle had been fought or a campaign opened.

"Where, it may be asked, are to be found the pilots to man these tens of thousands of aeroplanes? This will be one of the chief duties of the 'German Aerial League,' an institution which is daily growing in importance and influence."

GREAT BRITAIN

The British Official Statement of November 29th records aerial activity, despite a strong west wind.

"A nunber of photographs were taken and over 130 bombs were dropped during the day on the Courtrai, Roulers, Menin and Thourout railways stations and other targets in the Ypres battle aera. At night, in spite of a strong wind and clouds, seventeen heavy bombs were dropped on the Roulers Railway station, and many rounds were fired from machine guns into the enemie's huts in the neighborhood. One hostile machine was driven down out of control. Three of ours are missing."

The British Official Statement issued December 2nd reports the following aerial activity:

"Fifteen hostile aeroplanes were brought down and three others were driven down out of control. Seven of our machines are missing."

The full text of the statement reads:—

"Yesterday there were clouds at a height of 2,000 feet all day, but our airplanes were out continuously, co-operating with the other arms in counter-attacks against the enemy southwest of Cambrai. Our artillery machines, in addition to registering our guns, located and reported over two hundred hostile batteries.

"The bombing machines concentrated their efforts on troops and transport collected in villages in the rear of the battle, dropping over two hundred bombs. The enemy's troops and transport moving on the roads behind the fighting also offered good targets to our scout patrols, who fired over 15,000 rounds at them from their machine guns.

"The fighting in the air was very severe and resulted greatly in our favor. Fifteen hostile machines were brought down and three others were driven down out of control. Seven of our machines are missing."

A Washington dispatch indicates the constantly increasing importance of aeronautics in the suppression of the U-Boat peril. Although the sudden storms of winter tend to decrease aerial activity in this field, greater efforts are being made now than ever before. Many U-Boats have been sunk by well-aimed bombs from British Naval Aircraft, and no U-Boat is safe from the observers, no matter how deeply submerged.

Several captured aeroplanes and British machines which have participated in victorious encounters are among the exhibits at a London Aero Show being held to stimulate interest in aeronautics. There is a 160 h.p. German Albatross with a revolving machine gun turret, brought down by the late Captain Ball, V. C., of the Royal Flying Corps. Another trophy is the gondola of the Zeppelin L-33, which was brought down in England. The Morane-Saulnier parasol machine, used by Sub-Lieutenant R. A. J. Warnerford, Royal Naval Air Service, in destroying a Zeppelin over Belgium, is also on exhibition.



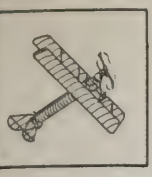
Two views of activities at one of the Chinese aviation grounds

Sir Eric Geddes, First Lord of the Admiralty, stated that the personnel of the Royal Naval Air Service had increased since the outbreak of the war from 700 to 41,000.

A special cable dispatch to the *Sun* reveals serious labor difficulties in the Coventry aeroplane works. The ministry of Munitions issued a statement pointing out that the delay caused by the closing down of the Coventry plant retards the entire output of the aeroplan industry and threatens the decisive supremacy in the air which the British fliers in France are attempting to maintain, and upon which the success of all the operations on the western front depend.

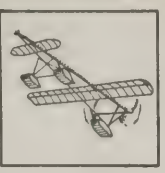
A temporary settlement of the strike had been reached, but the workers were dissatisfied with the way in which some of the terms of settlement had been carried out, and decided to strike again.

According to *The Aeroplane,* Great Britain is planning to build 40,000 aeroplanes between now and spring. The editor states that the growth of the Imperial Air Service must not ceaes until Great Britain has the same preponderance over all other nations in the air that she has on the sea. Such preponderance is the British Empire's only hope of survival in the future. The future will see a race between nations in aeroplane construction and surpassing the past and present race in naval construction.



MODEL NEWS

Edited by G. A. Cavanagh



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Model Builders' Attention

At the last Pan-American Aeronautic Exposition held at the Grand Central Palace, New York City, considerable interest was displayed in the models that were on exhibition. This year, however, we want to make the Model Exhibit at the show one of the finest exhibits ever held in this country and this can be done very easily with your co-operation. A considerable amount of space is being dedicated to the interest of model aviation by the authorities in charge and if all of the space is accupied by various types of models it is safe to say that the exhibit will be one of the leading attractions at the show and surpass any model exhibit ever held in this country. We want all of the model flyers who live out of traveling distance of New York, to be represented at the exhibit as well as those living in New York and vicinity and to facilitate matters all models can be sent direct in care of Model Editor, AERIAL AGE, 280 Madison Avenue, New York City. Models should be securely packed and provision made for reshipment. All models sent in accordance with the above instructions will be given the best of care and displayed in an attractive manner. A small descriptive card might be attached to the model to indicate owner, type of model and any possible records.

There is no doubt but that model flyers will appreciate that this represents an unequalled opportunity not only to display their handy work but to contribute their services to the general good of the cause. Let's get together on this occasion and show the spirit that exists among model flyers; send your model to the Model Editor at an early date.

The Dunn "A. B. Type" Model Biplane

The frame is constructed of birch, triangular in section; bottom longitudinals, 3/16 in. by ¼ in.; two top ones, 3/16 in. by 3/16 in.; crossbars, 3/16 in. by 3/16 in. It is 2¼ in. wide at the front (in plan form) tapering to 1 in. at rear, and 2½ in. tapering to 1 in. at rear (in elevation). Braced throughout with fishing cord. Planes double-surfaced and made as per Fig. B; gap, 6 in. Arc a, 3½ sq. ft. Aspect ratio, 6. Four uprights to main planes of ¼ in. by ¼ in. birch, and to which in the middle frame is connected by means of two U bolts, made from bicycle spokes. Ribs are spaced 3 in. apart and are glued and bound to the spars. Fabric, "nainsook." All braced together with fishing cord with wire hooks and eyelets. End skids of poplar and shown at Fig. D. Tail is constructed of 3/16 in. (birch) by ¼ in. wide, glued and bound at the joints. Rudder of ⅛ in. by ⅛ in. poplar, 4 in. by 3 in., fixed to post by aluminum hinges. Chassis, birch and poplar. The axle is rubber sprung, as shown at Fig. 8. Diamond strips of birch, 3/8 in. by 1/16 in., are used as bracing members. Section of skid is shown at Fig. C. Rear skid is shown at Fig. E, and is cut by fretsaw. It is rubber sprung. Propeller built up, and is made of Venetian blind laths, ⅛ in. thick, there are six layers blued all together. It is 14 in. diameter, and pitch about 20 in. It is fitted with bicycle spokes and nipples, and ball bearings. Motor, 18 strands of 3/16 in. flat rubber strip. Distance between hooks, 33 in. Hooks covered with valve rubber to prevent wear. Lubricant, castor oil. Weight complete, about 12 oz. Weight of rubber, 1½ oz. Longest flight, 120 ft.

A Twin Tractor Model

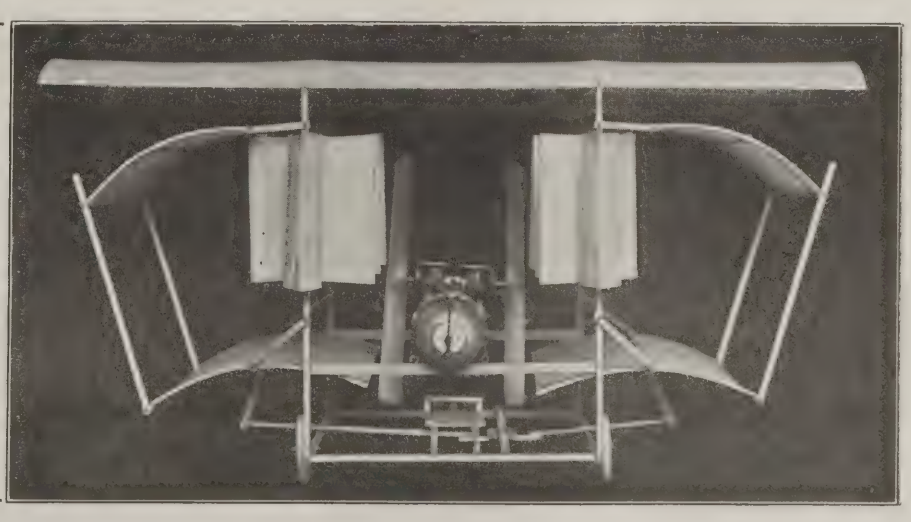
Mr. K. Wallace Crabbe, of St. Kilda, Victoria, Australia, sends the following description of his latest models:

"I enclose herewith description of a new type of twin-propeller (tractor) machine which I am building.

"It has movable elevators, twin rudders and skids. Main planes and tail of wire (18 gauge). Main planes have one wooden spar. *Fuselage* covered only as far as rear former so as to facilitate fixing rubber; six strands of ¼ inch to each propeller. Chord of planes 4 inches; of elevators and tail 4½ inches.

"I have had great success with tractors (Taubes and biplanes), but am now also building a part scale model of the Martinsyde mono.: Span, 34 inches; length, 36 inches; weight, about 6 ozs. Ribs fretted out of a two-ply of cedar and spruce, with three webs, and three three-ply formers in the triangular *fuselage*, driven by a 9-inch tractor.

"Thanking you for all knowledge, &c., I have obtained from your paper in the last few years."



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Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Fable

From the Highflyer

During the Great War I was sent to Factory where the Flying Boats was made, and thinking it might amuse the workers, I am writing these few impressions of what I saw and the people I met there. The Factory in question, after a long struggle, really impressed the powers that be, and a gentleman was sent down especially to strafe people, he was very tall and had a merry twinkle in his eye, but there is no doubt his greatest quality was tact as he was always called upon to pour oil on the troubled waters. There was also a weird and wonderful collection of gentlemen who had stamps with A. I. D. on them; these gentlemen spent their time filling up forms and making simple jobs difficult; they were really quite good fellows but officialdom had spoilt them with the exception of one who wrote articles for the Works Magazine and it was probably his sense of humor which saved him. The workers, both male and female, gave of their best and the high quality of their work did them great credit. The man who designed the Flying Boats gave one the impression that designing was a hobby and if it had not been for the war would probably have spent his time designing stream lene chicken. The Works Manager, who could look fierce at times, was a real good sort, and deserved all the nice things that were said about him. The Head of the Works Department was a man who had to put up with at least ten strafings per day, this was probably the cause of him trying to get his own back by strafing other people. The three persons just mentioned were once called the Holy Trinity, but there are no prizes offered for naming them. There were two people who looked after the welfare of the workers, but never during my stay at the factory did either offer to welfare me, so cannot say if the treatment was beneficial or not. There was at this place a wonderful house called the Power House; this was a Holy of Holies and none could enter there unless they were capable of eating electric bacon à la Thorneycroft.

P. S.—This was borrowed from a previous article with apologies to the author of same. I cannot close this article without a word on the Canteen, this was the place where we lived mostly on the Directors' promises of better food, etc., but am afraid during my stay the Directors were still promising.

"DEPARTED."

The War in the Air

A duel was lately fought in the air between Alexander Shott and John S. Nott. Nott was shot and Shott was not. In that duel it was better to be Shott than Nott, because Shott was not shot. But there was a rumor that Nott was not shot and Shott said that he was not, which proves either that the shot Shott shot at Nott was not shot or that Nott was shot nothwithstanding. It may be made to appear in trial that the shot Shott shot, shot Nott, or as accidents with firearms are frequent, it may be possible that the shot Shott shot, shot Shott himself, when the whole affair would resolve itself into its original elements and Shott would be shot and Nott would not. But we believe, however, that the shot Shott shot, shot not Shott himself but shot. Nott, and to make the whole statement clear is that Nott was shot by Shot and Shott was not shot by Nott.



Good Old Army Bean

"No more ham or eggs or grapefruit when the bugle blows for 'chow.' No more apple pie or dumplings, for we're in the army now, and they feed us beans for breakfast and at noon we have 'em, too, while at night they fill our tummies with a good old army stew.

"No more fizzes, beer or highballs when we've got an awful thirst. If you're thinking of enlisting best get used to water first, for the lid's on tight all over and the drillin' makes us warm, but we can't cool off with liquor, 'cause we wear the uniform.

"No more shirts of silk and linen. We all wear the 'O. D.' stuff. No more nightshirts or pajamas, for our pants are good enough. No more feather ticks or pillows, but we're glad to thank the Lord we've got a cot and blanket when we might just have a board.

"For they feed us beans for breakfast, and at noon we have 'em, too, while at night they fill our stomachs with a good old army stew. But, by gum, we'll lick the Kaiser when the Sergeants teach us how, for, dad durn it, he's the reason that we're in the army now."—Pittsburgh *Post*.

Lighter than Air Baseball

The game opened with Glue at the stick and Small Pox catching. Cigar was in the box, Strawberry Cake played short and Corn was in the field. Egg was umpire and he was rotten. Cigar let Board walk, Song made a hit, and Sawdust filled the bases. Then Soap cleaned up. Cigar went out and Balloon started to pitch, but went up in the air. Cherry tried it but was wild. Ice went in and kept cool until he was hit by the ball, then you ought to have heard Ice Cream. Lightning finished the game and struck out six men. Lunatic was put out because he was off his base. Bread loafed on third and Light was out on first. Crook stole second. Cabbage was manager because he had a good head. Knife was called out for cutting first base. Grass covered lots of ground and the crowd cheered when Spider caught a fly. Steak was put out on the home plate. Clock wound up the game by striking out. If Door pitched he would have shut them out.

Aeronitis Editor, AERIAL AGE,
280 Madison Ave.,
New York City

Up in the "Show-me" state where yours truly cultivated the habit of flying and contracted a severe attack of aeronitis for which he has not in nine years been able to find an efficient antidote, this question was asked by a Kentucky Colonel who had wandered away from his mint julep long enough to be separated from a fifty cent piece:

"What kind of liquor do you take, Sur?"

When informed that aqua pura polluted with essence of coffee was about the strongest he said: "I gad suh, I am sorry I cannot accommodate you, but I'll send you some from Louisville."

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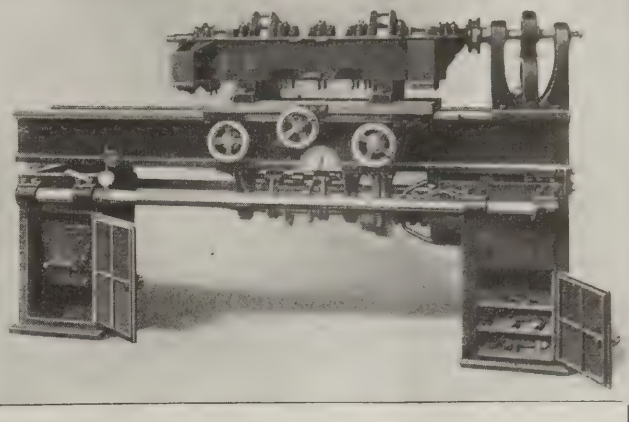
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11. Last, but not least, a page of aeronautical humor in verse, prose and illustration.

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7. By **the Air Service Student** who acquires a broad knowledge of what is happening in the Air Services in the United States, and Europe, and for whom we print special articles in French describing the machines with which he will require to become familiar.
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We endeavor to give preference to orders for war service, but suggest that such orders be placed early.

The remarkable saving in time by the Carwen method makes its use for airplane crankshafts doubly valuable at this time.

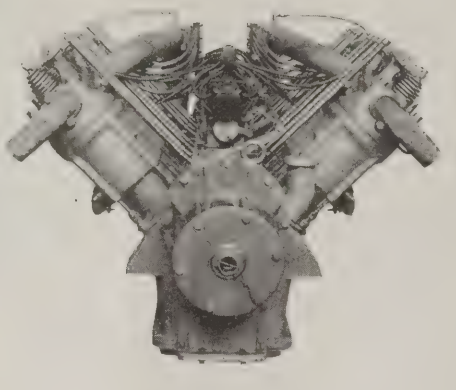
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Super-Induction Aircraft Engines

(Editorial in *Automotive Industries*)

WHAT may be regarded as the standard type of aircraft engine of the present is the four-stroke engine with atmospheric induction. It would seem that this type of engine has been developed to a very high degree and but little further gain in weight efficiency is to be expected from it. Some engineers believe that good results could be obtained from the practice of super-induction or forcing into the working cylinder more charge than it can pump in itself when in direct communication with the atmosphere. All engines when giving their maximum output have a volumetric efficiency of only 70 per cent or less, and as they must be built to stand the explosion of a complete or 100 per cent charge, they are not working to the best advantage. In aircraft engines operating at high altitudes the conditions are still worse, and the volumetric efficiency may drop below 40 per cent; which is to say that the amount of air taken into the cylinders at each suction stroke is less than 40 per cent of the piston displacement volume of air under atmospheric pressure at sea level.

It has been held that super-induction is impracticable because even with atmospheric induction it is difficult to prevent preignition. This would be true if the compression ratio—that is the ratio of the combustion chamber volume at the end of the compression stroke to the volume at the beginning of this stroke—remained unchanged. In practice, however, the compression chamber volume would be increased so that the compression would be no greater than with atmospheric induction. There would then be the same explosion pressure, but as the piston moved away from the top end the pressure would be maintained better in the super-induction engine, hence, its mean effective pressure would be greater.

Super-induction, of course, requires the provision of a charge pump, which may be either the crank chamber, an annular space below the working cylinder of the engine or an entirely separate pump, possibly of the centrifugal type. Whatever form the pump had, it would add some weight and the amount of this weight would be one factor in determining the value of the engine. It must be conceded that, since the ability of aircraft to operate and carry loads at altitudes where barometric pressures are down about one-half is an important demand, the principle looks very attractive. For instance, if by means of super-induction an engine operating at 20,000 ft. altitude could be made to take a 70 per cent charge, instead of a 35 per cent charge, which seems not at all impossible, the gain would be enormous.

One disadvantage of the super-induction principle, and which would make it unsuitable for long-range machines, is that the fuel economy is inevitably somewhat reduced, as the engine works virtually at a low ratio of expansion.

Air Traffic Coming

(Editorial in the Yonkers, N. Y., *Herald*)

WHEN the war is over the belligerent nations will have great supplies of aeroplanes on their hands and no obvious use for them unless air transport becomes popular in peace times. The Aero Club Club of America, foreseing this, is moving for an international commission to look into the matter.

Statistics will be interesting. We know that in the armies flying is a commonplace, and none of the men engaged in the work seems to think anything of its perils. We hear little of accidental falls and much of successful flights over long distances and under perfect control. But we know very little specifically of actual experience in the new means of locomotion. It will not be surprising if we learn, when the facts are gathered, that the art of flying is ready now for ordinary service.

We shall certainly have thousands of men capable of handling the machines in the most trying conditions and many of the problems of structure and motive power will have been finally solved. Reports are coming from Italy and Germany of planes capable of carrying ten or a dozen persons. A ton of explosives is not too much burden for some of them. The automobile was less advanced ten years ago.

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AERIAL AGE WEEKLY

ol. 6, No. 14 DECEMBER 17, 1917 10 CENTS A COPY



Kite Balloon Observing Artillery Fire on the Western Front (Official Photo)

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Liberty Aeroplane Program Well Under Way

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SECRETARY DANIELS' REPORT

NEVER has Secretary Daniels made a more satisfactory annual statement than the report just published. If the note he sounds seems jubilant and optimistic, there are reasons for it. The expansion of the navy has been a remarkable achievement, and its performance in eight months of war proves what Mr. Daniels maintains, that it was ready for duty. "In this period the Republic," he says, "has been fortunate in the capacity of the naval officers who have filled important stations ashore as well as in the splendid men who have commanded fleets and ships. There has been the heartiest co-operation and the most perfect teamwork."

Concerning the aircraft program, Secretary Daniels said:

"In my report a year ago I was compelled to state that the development of aircraft in the navy has not progressed as rapidly as its usefulness demands. During the last year there has been an enormous expansion and development of the naval air service which may be said to date from the passage of the naval act of August 29, 1916."

"During the present calendar year the ratio of increase in material has been approximately 1,400 per cent., the increase in personnel trained and under training has been approximately 3,000 per cent, the increase in stations and training schools has been approximately 3,200 per cent."

"The service has been so popular as to attract to it scores of young men of real stuff, some from factories, who loved engines and machinery, and some with college diplomas, who were eager and quick to learn the new and daring adjunct of war. They have demonstrated the courage and capacity of American youths, and the only complaint heard from any of the young men in the Aviation Corps has been that the factories could not provide aircraft rapidly enough to give them as much opportunity to fly as they desired."

In the matter of appropriations the total the Secretary asks is $1,039,660,502.84, saying this is needed for the vigorous prosecution of the war. The appropriations made the present year amounted to $1,590,732,859, which, taken in connection with the $312,678,071 appropriated Aug. 29, 1916, makes a total of naval appropriations in a period of little more than a year of $1,905,410,930. This exceeds the sum of appropriations from 1883 to 1911.

"The appropriations for aviation for the navy since July 1, 1916, have been $67,633,000. Up to this time naval aviation had been almost entirely in the experimental and development stage, and there were comparatively few officers who were aviators. During the development and experimental work every type of seaplane offered by any builder in the United States has been tried. None of these had been found fully satisfactory by the flying schools at Pensacola, and a year ago the flying school itself was temporarily crippled a hurricane of exceptional violence, which did much damage to building and equipment."

Although, as stated yast year, the material situation was not satisfactory, the department had thoroughly overhauled the organization for aeronautics and arranged for the co-ordination of all activities which would be needed in developing an adequate air service by delegating responsibility for its creation definitely to the Chief of Naval Operation and the material bureaus of the Navy Department. This organization has proven sound during the expansion and development of the last year.

With the entry of the United States into the war the demand for aircraft from the War and Navy Departments necessitated an enormous expansion of production facility. As a part of this expansion the department undertook to build and equip a naval aircraft factory at the Philadelphia Navy Yard. Within ninety days from the date that the land was assigned the factory was erected and the first flying boat keel laid.

The Aircraft Production Board, now the Aircraft Board, then assisted the department with its larger contracts and arranged to make available for the navy industrial resources to meet the next year's programme. Five private plants are devoted entirely to navy work, and a large proportion of two other plants are assigned to the navy. These are all concerns which have demonstrated their ability to construct successful aeroplanes and selected in accordance with the department's policy to require the greatest skill and integrity of workmanship in all aircraft issued to the service. The requisite skill is only obtained by experience in the art.

LIBERTY AEROPLANE PROGRAM WELL UNDER WAY

PRODUCTION of Liberty aeroplane motors on a quantity basis actually has begun. American army aviators are in training on the fighting lines in Europe and the nation is within sight of realization of the great air fleet project mapped out since the United States entered the war.

Figures cannot be published. It is known that members of the air board who returned recently from an inspection trip to plants and flying fields are satisfied that another sixty days will see men and machines being turned out at a rate that insures the ultimate success of their plans.

The first machine-made Liberty motor was completed on Thanksgiving day, and a substantial number of the machines will be delivered this month. The machine-made product has functioned under test as satisfactorily as the hand-made motors first constructed and so far no important defect in design has revealed itself.

Other plans will begin delivery of machine-made motors within a few weeks. One will have a capacity of several thousand completed motors a month. With all plants working, the monthly production of motors not only will permit the equipment of the air forces the United States is raising and training, but will also permit the government to supply many thousand of the engines to various of the Allied powers that have asked for them to supplement their own output.

Meanwhile training of the men—aviators and observers and thousands of mechanics needed to keep the fliers in the air—is moving forward steadily, both at home and abroad. The capacity of the plant for producing aviators at home has been expanded to the point where the most serious problems now facing the government in this part of its war work is to get enough students of the right kind to educate.

The ground schools are turning out every week a large class ready for preliminary flying work. Probably a fifth of the men admitted to the ground schools fail to complete the vigorous course of general instruction required. Certainly an equal percentage drop out before each class passes on through its preliminary flying course.

It is no secret, however, that many candidates for the

coveted rank of junior military aviator have already been sent overseas. Probably the number at work abroad is far in excess of that figure. They are training in every allied country that specializes in aviation, and reports from France, England and Italy have noted their presence.

The equipment for the vanguard of the airmen is being obtained abroad. It includes planes of the most up-to-date fighting types and for training purposes in this country. Similar machines have been brought over. They will be needed to familiarize the men with engines they might be called upon to operate on the other side.

An Important Object Lesson

ON THE front page of the New York *Times* of December 10, there was presented the most forceful argument for a huge aerial program that has come to our notice for some time. It consisted of two despatches, one from the Italian headquarters, and the other from London. A parallel is interesting:

AIRMEN SCATTER TROOP TRAINS AND BLOW UP MUNITION DUMPS—ALLIED FORCES IN LINE.

Italian Army Headquarters, Dec. 8.—The battle of Asiago is virtually suspended, with the enemy checked, if not defeated, in his main design of breaking through to the Brenta Valley.

An exceptionally large air raid was carried out yesterday with a fleet of 150 aeroplanes, including Italian light and heavy squadrons. The huge fleet flew low, scattering more than 2,000 bombs, which caused extensive damage in the northern sector, where the enemy is assembling forces and supplies. Troop trains were scattered, railway depots destroyed, and munition supplies blown up. Large fires marked the route of the raiders, indicating the extent of the destruction.

GERMAN RAILWAYS ARE CONGESTED BY MOVEMENT OF TROOPS FROM THE EAST.

London, Dec. 9.—Despatches from the British front before Cambrai report a continuation of the week-end lull in the larger offensive operations by both sides.

A Geneva despatch says that Field Marshal von Hindenburg and General von Ludendorff have both gone to the Cambrai front, according to news from Strassburg. Railway traffic through the Rhine towns has been congested for several days, it is also reported from this source, owing to the flow of troops and artillery being rushed through to that front. No civilians are permitted to travel along the Rhine and the German frontier remains closed.

Dealing with the left column—what other weapon could have accoomplished the results? And with the right—aeroplanes, battleplane, and then some!

The Aeroplane and the Atlantic

(Editorial in the Cincinnati, Ohio, *Star*)

ALAN R. HAWLEY, president of the Aero Club of America, has made the statement that "the Atlantic is to be crossed in the air within a few months and the difficult problem of delivering to Europe the aeroplanes needed for striking Germany will be solved thereby." Major Perfetti of the Special Italian Commission for Aeronautics in the United States, supports this statement. In addition, Howard Coffin of the Federal Aircraft Production Board says "great hydroaeroplanes now being constructed in the United States may be expected to make the flight across the Atlantic at no distant day."

The great Caproni triplane, of 600 horsepower, capable of carrying a heavy weight of fuel and supplies, is to be the craft used on these pathfinding flights across the sea. A route from Newfoundland to the Azores, 1,195 miles, and from the Azores to Portugal, 850 miles, will be followed. Predictions are made that the trip will be made in approximately twenty-four hours of flying time.

Had not the war intervened, the Atlantic Ocean might have been crossed by an American machine in the fall of 1914. At that time a great plane called the "America," was built under the direction of Rodman Wanamaker, who had offered a prize of $50,000 for the first aircraft to cross the Atlantic. Lieut. Porte, of the British Naval Flying Corps, was to have made the flight, but he was recalled to his duties before he could make a start. Failure, of course, might have resulted, but the prospects for success at the time appeared good.

Strides made in aeroplane and engine construction since the war began have been so rapid that a pioneer flight across the Atlantic, and perhaps occasional repetitions of the feat may now be feasible. But that we soon will be sending across the wide water fleets of these craft under their own power is open to doubt. The enthusiastic friends of American air defense may be a little over-sanguine. Before such wholesale deliveries could be made, most elaborate organization would have to be accomplished and many pilots would have to be trained for a special and an extraordinarily difficult task. However, we have seen so many marvelous accomplishments since the war began that it is not safe to say this particular thing cannot be done.

A Billion Needed for Our Air Fleet

(Editorial in N. Y. Times)

THE Italian inventor Caproni, one of whose giant biplanes flew over New York the other day to scatter Liberty Loan leaflets, predicts great activity by the Germans in the air in the Spring.

The enemy is hard at work, be sure of it. Having formidable labor resources at his disposal well-disciplined labor, directed by engineers who manifest all the severity of officers, he is turning out his Gothas and his Friedrichshafens with incredible speed. Next Spring we shall witness the budding forth of a fantastic effort in aviation. For the first time in the war the rear will suffer almost as much as the front.

Signor Caproni believes that bombardments from the air will take place at Paris, Lyons, Le Creusot, and St. Etienne on a prodigious scale, destruction of munition plants and depots being the chief purpose of the enemy.

Hitherto raids have been made by a score of aeroplanes. The time is coming, if the war continues for years, when attacking planes will be counted by hundreds. They will carry many tons of explosives and manoevre like warships at sea in tactical formations. It will then be impossible for camps, stores, great munition works like Krupps and Le Creusot, and troops moving in masses, to escape the shattering force of explosions. So many bombs will fall that the target must often be hit. Even now considerable damage is done by raiders. Great Britain has suffered more than appears in official reports; casualties may be given correctly, but little is said of the destruction of property in ports and cities. The Germans also put out deceptive bulletins when the French and British attack their bases. Magnify the raiding parties by ten, twenty, and even a hundred, and there would be red ruin, a ghastly story to tell. That is what the Germans are planning. America and her allies, therefore, must have the mastery of the air to win the war.

Incredulity cannot stand against the briefest survey of present aerial resources, and they are in process of rapid expansion. The American people must understand how urgent is the necessity of multiplying planes until the production can be spoken of in terms of hundreds every day. It is true that totals of machines used by the Entente Allies and the enemy are not available. Military secrets are never disclosed. Conclusions must be indefinitely drawn from what happens at the front and from organization. In ten months ended in October the French aviators, with the Lafayette Escadrille assisting, destroyed 517 German planes on the western front and brought down 513 others, which fell inside the German lines. German claims always exceed those made by the French. The British are quite as successful as their ally on the western front. How actively construction and training are going on in Great Britain may be judged from this extract from *Aeroplane:*

Every aerodrome employs dozens of officers and hundreds of men. The squadrons run into hundreds, the officers into thousands, and the men into hundreds of thousands, and still the corps keeps growing. New aerodromes are constantly opened.

What the Italian resources are is equally conjecture. In five weeks at the front the enemy was bombarded forty-eight times by 242 Caproni machines, which dropped forty-five tons of explosives. It may be said deliberately that on the western front, from the Channel to Switzerland, the reconnoitering, fighting, and bombing airplanes are now numbered by the thousand. Both sides claim supremacy in the air. The opportunity rests with America to give her allies such a great preponderance that the enemy will be driven from the skies altogether, impotent to give battle or to defend himself. That is why General Squier, Chief Signal Officer of the Army, asks Congress for an appropriation of $1,138,240,314 for the fiscal year 1918-19.

Of this amount General Squier proposes that $1,032,294,260 be expended on aviation: $553,219,120 on extra engines and spare parts, $235,866,000 for airplanes and hydroaeroplanes, $77,475,000 for machine guns, $8,050,000 for schools of military aeronautics, and the balance for stations, depots, equipment, upkeep, and pay for instructors, inspectors, mechanics, engineers, accountants, etc. A combination of instrumentalities will win the war, but it cannot be won without mastery of the air. Members of Congress who have been at the front can tell their colleagues how indispensable to success is paramountcy in flying. A billion added to last year's appropriation would not be an excessive price to pay for it.

For thousands of aeroplanes there must be a great army of aviators, mechanicians and helpers. Flying casualties are not so great as those in the infantry; the difference should be reassuring to men who think of joining the aviation service, but have been told it is extra perilous. Enlistments for the Army and Navy will not be received after December 15, when the new draft goes into effect, but the War Department announces that exceptions will be made in favor of the Aviation Corps.



The News of the Week



Aviators Compliment President Hibben

The aviation students who have just completed their eight weeks' ground school course at the Aviation Section Ground School at Princeton University have written a letter of thanks to President John Grier Hibben for "the best barracks, best mess, best surroundings, and most courteous treatment," which had been accorded them during their stay at Princeton.

"We wish Princeton to know," the letter continued, "that with such backing we will do our part on the other side."

Resnati to Attempt Coast to Coast Flight

Despite the recent wreck of his largest Caproni machine recently, Lieutenant Resnati is reported to have stated that he will attempt the transcontinental flight before the end of the month.

An aeroplane as large as the one destroyed, having accommodations for twenty-four passengers is being assembled.

Lieutenant Resnati is recovering from the injuries sustained in the accident, and will soon be ready for more flights.

Motor Boat Tender for Hydroaeroplanes

One of the exhibits at the Motor Boat Show opening January 19 at Grand Central Palace which will be of interest to aeronauts is a Langley tender used for handling hydroaeroplanes. It was built from designs by J. Murray Watts and is equipped with a 150 horsepower model F-M Sterling motor. There is a powerful derrick and winch so located that a damaged aeroplane can be lifted onto the deck, and the boat is well equipped with bench and tools, and has space for spare parts, fuel, etc., as well as accomodations for four men. The deck beams are strong enough to support anti-aircraft guns.

Advisory Committee Assists Aerial Mail Service Development

Washington.—The National Advisory Committee on Aeronautics announced that plans for the use of aeroplanes unsuitable for military service by the Post Office Department are maturing. Funds amounting to $100,000 have already been made available by Congress for experiments in delivering mail by aeroplane, but no other steps have been taken regarding the purchase of machines, in order not to interfere with military preparation. But planes now constructed are rapidly becoming obsolete for military service and plans are under way for their utilization as mil carriers.

Aviator Held As a Spy

Los Angeles.—Alexander Von Bodo, said to have been honorably discharged from the United States School of Aviation at San Diego, was arrested here today on a charge of violating provisions of the Espionage Act. It is alleged that Von Bodo gathered information relating to aeroplane manufacture in this country for the purpose of communicating it to the enemy.

Among his effects, according to the Federal authorities, was a card indicating that he held a pilot's license from the Imperial Aero Club of Austria.

Labor Shortage in Aeronautic Industries

The results of a survey made by the employment agencies of the Department of Labor order plans, 57% of which comes from aeroshows a shortage of 23,048 workers in war plane and hydroaeroplane manufacturers.

Wardrop Lectures at Buffalo

G. Douglas Wardrop, editor of Aerial Age, addressed the Buffalo Section of the S. A. E., and the Buffalo Engineering Society on December 5 at the Hotel Statler. The audience was a large and appreciative one, and the lecture, covering every phrase of The War in the Air, was listened to with close attention. Mr. Charles Manly commented on the standardization program at the conclusion of the lecture.

On December 6 Mr. Wardrop addressed the 1,500 students of the Buffalo Technical High School.

To Manufacture Aeroplanes

Louisville.—The Darling Air Craft Co. has filed articles of incorporation to manufacture aeroplanes and to conduct a school for flying instruction. The capital stock of the company, which will have its principal offices and place of business in Louisville, is $25,000. Omar F. Darling is president and Henry T. Kraft, secretary.



Mr. F. G. Diffin, chairman of the International Aircraft Standards Board, who is devoting his whole time to the government's aeronautic program

Lincoln Concentrates on War Work

Detroit.—Although the plant of the Lincoln Motor Co. now building at West Warren Street is not yet completed, the company is occupying a two-story plant near Holden and Lincoln Streets and is preparing for production of the Liberty engine. This plant is about 100 by 600 ft., and contains the general offices of the company in addition to the shops. The company is now tooling up for the coming production, and it is stated that orders for equipment and tools have been placed in nearly every large machine shop in the country. Contrary to the general belief that skilled labor is plentiful, due to the laying off of men from the automobile plants, H. M. Leland states that such is not the case, and reports that few men are available from that source. It is expected that many women will be employed in this factory when actual production is well under way. The present wage paid averages 45 cents per hour.

Goodyear Sales Total $111,549,552

Akron, Ohio, Dec. 3—At the annual meeting of the stockholders of the Goodyear Tire & Rubber Co. is was announced that the total sales for the year ending Oct. 31 amount to $111,549,552. This is an increase of 74.37 per cent over those of the preceeding year. About 10 per cent of the world's entire supply of crude rubber, totalling 23,000 tons, was used during the year. It will be noted that the drive to pass the $100,000,000 mark was exceeded by $11,549,522.

Air Route Marked Out

Indianapolis.—As an aid to the training of aviators for the United States service, an air route from Dayton, Ohio, to Rantoul, Illinois, has now been well defined, under the direction of Carl G. Fisher of Indianapolis, Ind., chairman of the mapping committee, appointed by the National Advisory Committee on Aeronautics.

The initial program for a marked route consisted of serial numbers painted in large white figures on barn roofs, with an arrow pointing the direction where a clear field of the proper area for safe landing might be found, in event an emergency landing was necessary.

With the Indianapolis Motor Speedway as a central point landing field, large numbers from 1 to 72 were painted on barn roofs between the Speedway and Dayton, at an average distance of about two miles apart. From the Speedway to Rantoul the field numbers range from 1 to 28. The distance between the fields on this end of the route averaged about four miles from one to the other.

Following the landing field or daylight route marking scheme, the second phase of the work was to afford assistance in furthering the difficult training in night flying. A patriotic spirit and the desire to assist the Government prompted the citizens, town authorities and civic organizations of the various municipalities selected for signal stations to purchase, erect and provide for the maintenance of signal lighting equipment at Fairfield and Wright flying fields near Dayton, at Dayton and Eaton, Ohio; Richmond, Cambridge City, Knightstown, Greenfield, Cumberland, Ft. Harrison, Indianapolis, Indianapolis Motor Speedway Landing Field, Brownsburg, Jamestown, Crawfordsville, Waynetown, Veedersburg and Covington, Indiana; Danville and Champaign, Illinois, the latter city being only ten miles south of the Government training field at Rantoul, Illinois.

Signal equipment consists of four or six light projectors with red or green lenses, equipped with lamps of 200 watt capacity. For indicating the direct flying route from the Dayton flying fields to the Rantoul field, lights flash on and off at about six second intervals. To assist the pilot to check his location, the station at the end of the first fifty miles west of Dayton flashes green and red alternately. The completion of the second fifty-mile leg is indicated by the rapid flashing signal for the Indianapolis motor speedway landing field. Continuing west, the third checking signal consists of six green lights flashing on and off, indicating Crawfordsville, Indiana. Again at Danville, Illinois, the light flashes red and white at six second intervals. All other units which indicate to the pilot or his observer that they are following the direct course employ red lights flashing on and off at the regular stated intervals.

Drifting with the air currents and unconsciously leaving the direct flying course will be corrected by a system of side marking lights.



The training machine of the Goodall Aero Company, and one of the girl students, ready for a lesson

New Carburetor Makes Kerosene Suitable for Gasoline Motors

The Department of Interior made known that a new carburetor has been perfected which can be used with any gasoline engines, without alteration of any kind. The patent rights for this carburetor will be turned over to the Government without charge for the period of the war.

If this invention proves practical the threatened shortage of gasoline for war purposes will be averted. The enormous demands made by motor trucks, aeroplanes and automobiles for gasoline has been a cause for serious concern for those well informed regarding the situation.—N. Y. Sun

American Aviator Lost in France

Eric Anderson Fowler, youngest son of Mr. and Mrs. Anderson Fowler, of New York City, was killed while training at Pau, France. Fowler is a Princeton graduate, and served in the ambulance corps before our entry into the war. He was buried with full military honors.

Mineola Aviators Play Scoreless Tie with Fort Slocum Eleven

Because nine regulars of the Aviation team were not permitted to leave camp on account of the epidemic of measles there, the Fort Slocum team escaped defeat. The Aviators were not familiar with their signals and fumbles and penalties for offside and holding characterized the game.

Quick Wit Saves Aviator

Belleville, Ill.—Cadet J. L. Simpson, while flying over Scott Field at an altitude of 1,500 feet, turned upside-down and came crashing to earth. Simpson found it impossible to right his machine during the drop, and realized that if he remained in the pilot's seat the motor would crush him to death. He succeeded in unstrapping himself and climbing on the upturned side of the wing before the aeroplane reached the ground. Simpson was thrown several feet clear of the machine, but escaped with several broken teeth.

Regular Air Service Planned

Belleville, Ill.—In order to facilitate the transportation of officers from Belleville to St. Louis, Lieutenant Fred Harvey, military instructor at Scott Field, is establishing an aerial route. Several landing places have been examined, and when the project is put into operation, it will be the only regular aeroplane schedule in operation.

H. P. Whitney's Son Completes Aviation Training

Cornelius Vanderbilt Whitney, son of Harry Payne Whitney, has completed his training at Princeton for the Aviation Corps, and will probably soon be on active Aviation service.

Wandering Army Balloon Captured

A huge new type of French observation balloon inflated with 35,000 cubic feet of gas, trailing 6,000 feet of steel rope, finally came to earth in Kansas, after enjoying complete freedom for nearly twenty-four hours. In the course of its ramblings, this balloon went first from Nebraska to Kansas, then to Oklahoma, and finally back to Nebraska, where it was captured.

The heavy steel cable which should have held it in check left behind it a trail of broken telegraph and telephone wires, as it dragged over the ground. At Newton, Kansas, it did considerable damage to the residential and commercial districts of the town. At another point, it tore off the roof of a house.

Brazilian Military Commission Arrives

A commission to work for close co-operation between Brazil and the United States in the conduct of the war arrived at an American port.

There are eight members in the commission, Col. Alitro Cama, Major Borges Forts, Capt. Alexandre Bueno, Capt. Lisboa, Capt. Jacob Noguerra, Lieut. Santos, Lieut. Luis Tropjo and Lieut. Marcolino Sogundes, who is secretary to the commission.

The party was met at the pier by H. C. de Martens, Brazilian consul-general at New York.

Army Aviators Injured

Dallas, Tex.—Lieut. McFarland, of the Royal Flying Corps, stationed at Forth Worth, was seriously injured and a student aviator, who has not been identified, was probably fatally hurt, to-day, when their airplane fell 200 feet, near Duncanville, seventeen miles southwest of Dallas.

Trincard Killed in Aerial Accident.

Paris, December 5.—Charles Trincard of Brooklyn, a member of the Lafayette Flying Corps, was killed in an aerial accident Sunday. He was the first American member of the Foreign Legation to join the Lafayette Flying Corps. Trincard had applied for permission to visit his family, and had been expecting day by day to leave camp. Permission arrived in a few minutes after his death.



One of the most effective posters used in Canada's Victory Loan drive, suggested by F. G. Ericson, the Chief Engineer of the Canadian Aeroplanes Ltd.

Aviator Lufbery's Score Now 17.

Paris, December 5.—Lieut. Raoul Lufbery of Wallingford, Conn., a member of the Franco-American Flying Corps, brought down two more German machines Monday, making seventeen in all. Of this number sixteen have been officially credited, but the seventeenth has not yet been confirmed by the official observers, who are making an investigation.

The Aeroplane Speaks

This unique treatment of the subject has deservedly attracted wide attention both in England and America. It has been adopted by the U. S. Government for use in the instruction of its aviators, and proved a popular volume among the general reading public. The author makes the various parts of an aeroplane actors, as it were, in a long dialogue, giving them the power of speech. Each part explains its own particular functions and its relations to its neighbors in an animated discussion which carries the reader along rapidly through many intricate problems of the science. The idea of thus explaining mechanical questions in the first person, like so much fiction, has probably been borrowed from Kipling's famous story, "The Ship That Found Herself," and upon the whole is very successful. The speaking parts, as they may be called, are such familiar characters as Lift and Drift, Miss Efficiency, High Aspect Ratio, Struts, Chord, Surface, and scores of others. Practically every page is attractively illustrated by drawings of aeroplanes or scenes of machines in flight which visualize the dialogue. The discussion makes very interesting reading. The author is well prepared for his task, having had eight years of practical experience in designing, building and flying machines.

Following the dialogue several detailed chapters will be found dealing in more prosaic fashion with flight, stability and control, rigging, propellers and maintenance, which are especially to be recommended for the manner in which the subjects are divided and subdivided for the convenience of the student. The illustrations throughout the book are excellent. A very good glossary is included. One of the most valuable features of the book is a remarkable collection of pictures of types of aeroplanes, dating from the Ader Avon of 1897 and including upwards of 500 different types of machines in many countries. The Aeroplane Speaks, by H. Barber, A.F.Ae.S., Captain Royal Flying Corps. Obtainable at The Aeronautic Library, 280 Madison Avenue, New York City. The price is $2.60 postpaid.

Aviators Defeat Sailors on Gridiron

New York.—Ray Watkins, quarter-back for the team representing the Aviation Corps Station at Mineola against the Naval Reserve Training Station, Pelham, New York, was an important factor in the Aviator's 14 to 7 victory. The Aviators made two touchdowns in the first period, but were unable to score again after the Sailors' defense had stiffened. The Sailors scored their touchdown in the second quarter.

Lieut. O. B. James Weds Miss Krech

New York.—Lieutenant Oliver Burr James, Aviation Section, U. S. N. R. F. married Miss Alvin W. Krech, daughter of Dr. Walter B. James, President of the Equitable Trust Company at St. Bartholemew's Church.

War Department Cannot Accept Miss Law

Washington.—Although President Wilson and Major-General Squier, Chief Signal Officer, U. S. A., are interested in Miss Law's application for entrance in the Army Air Service, the Judge-Advocate believes it will be impossible to accept her services, either as commissioned officer or in enlisted service in the United States Army, unless special provision is made by Congress.

Accident at Chanute Field

Two aeroplanes crashed together at a height of 300 feet at Chanute Field, Rantoul, Ills., injuring both aviators and wrecking their machines. One of the pilots, Moses, remained in critical conditions for some time, while Frieberg, who piloted the other aeroplane was reported as being out of danger within a short time after the accident.

Acquiring Wings

So simple and concise a treatment of the principles of aviation has not heretofore come to our attention. The book runs to scarcely fifty pages, but includes a surprising amount of information. The layman in such matters will find this an excellent little book with which to begin any study of aeronautics. It may be said to begin quite at the beginning of the science, since the first pages describe some simple experiments with a piece of blotting paper to illustrate the principles of flight. A small paper glider is next used to develope the reader's knowledge of wing theories. The comprehensive character of the little volume is indicated by the table of contents which includes among other divisions: wing range, head resistance, value of streamline, aspect ratio, nomenclature, passenger location, plane balance, controls, steering, and a score of similar subjects. The military types of aeroplanes are explained, including battle planes and bombers, the cost in man-hours and similar subjects for discussion. The book is profusely illustrated by scores of drawing. The original manuscript of the volume was prepared for American aviators who were taking up the subject for the first time, and was circulated in the form of type written copies. The success of the manuscript led to its amplification and illustration in its present form.

Acquiring Wings, by W. B. Stout, obtainable at The Aeronautical Library, 280 Madison Avenue, New York City, for 85c., which covers carrying charges.

NAVAL and MILITARY AERONAUTICS

State Senator to Be Army Aviator

Ithaca, N. Y.—A special dispatch to the "Herald" announces that Morris S. Halliday, of Ithaca, serving his second term in the State Senate from the Forty-first district, comprising the counties of Chemung, Schuyler, Tioga and Tompkins, to-day enlisted in the Signal Corps Reserve Aviation Section and on December 15 will report to the training camp at San Antonio, Texas. Senator Halliday soon will forward his resignation to Governor Charles S. Whitman at Albany. A special election to name his successor will be necessary, Senator Halliday, who is one of the most prominent republicans in the southern tier, is an Ithaca lawyer. He is a graduate of Cornell University and while in college won a reputation as a football player. He was first elected to the State Senate in 1914. Mr. Halliday has been a member of the Ithaca company, New York State Guard.

Official Insignia for Army and Navy Adopted

Secretary Daniels and Secretary Baker have agreed on the official insignias for army and navy aviators. There are to be three classes of aviators: military aviators, junior aviators, and reserve military aviators; and one class of observers.

The insignias are as follows:

(1) Military aviator: Double winged shield, with five point star, attached above, embroidered in silver on blue background, and the letters U. S. embroidered in gold on the shield.

(2) Junior aviator: Same as above, with the exception that the star is omitted.

(3) Reserve military aviator: Same as junior aviator.

(4) Observer: Same as military aviator, except that star and right wing are omitted.

The naval aviators wear a fouled anchor with the letters U. S. superimposed between two spread wings.

The insignias for enlisted men in the army aviation section are as follows:

(1) Enlisted aviators: Four bladed propeller with two wings embroidered in white on blue background.

(2) All others; except aviation mechanics and enlisted aviators: Four bladed propeller, embroidered in white, worn on sleeve.

8,000 Young Men Wanted for Navy's Flying Corps

Eight thousand young men are wanted for the ground personnel of the Navy's Flying Corps. Secretary Daniels has authorized the enlistment of this number, and the recruiting officers of the country will at once begin a drive to enlist the men required.

There is an immediate need for mechanicians for naval aviation for the ratings of machinists' mates, carpenters' mates, quartermasters, coppersmiths, and blacksmiths. These men will not be enlisted for pilot's duties, but will receive special training in the building handling, repairing, and overhauling of the Navy's air craft. Ten men are required to keep each machine in order and make safe the flight of the air pilot.

Requirements for Enrollment

The requirements for enrollment will be the same as those for the regular service of the United States Navy. Training for machinists' mates and quartermasters will last about three months. Carpenters' mates will train for approximately six weeks. On completion of the training, the provisional landsmen, after examination, will be rated first or second class petty officers. They will then be eligible for promotion to the next higher grade, if they show fitness and pass the necessary examination. The age limit for this enlistment is 21 to 35 years. Candidates must pass the regular Navy physical examination. Men enlisting for aviation duty but failing to qualify will, if recommended by their commanding officers, be assigned to general service.

Trades Covered by Ratings

The following trades are covered by the ratings: Carpenters, woodworkers, machinists, coppersmiths, blacksmiths, fabric workers, riggers, acetylene welders, gas-engine repair men, and instrument makers.

Landsmen for quartermaster need have no previous trade experience, but general manual ability is necessary. Men of trades, such as rigging, fabric working, and wire working, are desired, as are also men experienced in the operation of hydrogen plants or in the care and upkeep of dirigibles or balloons. Men who display proficiency on dirigible work will be assigned to this branch.

Carpenters' mates will look after the upkeep and repair of wings, pontoons, flying-boat hulls and bodies, balloons, and dirigibles. Their training will cover the practical application of their trade skill to general aviation work.

Machinists' Mates.

Machinists' mates must show previous experience in gasoline engines or any allied trade such as that of electrician. They will be trained in the upkeep and overhaulng of aircraft engines.

Provision is made for men especially well qualified for enlistment or enrollment as carpenters' and machinists' mates to be enrolled directly for that second-class rate should their skill be sufficient. The rating badges for men in this service will be the same as in the Regular Navy, except for the addition of double wings.

Quotas for Enlistments

Quotas for enlistments for the various districts have been arranged as follows:

Eastern Division: Machinists' mates, 900; quartermasters, 900; carpenters' mates, 390; blacksmiths, 30; coppersmiths, 40. To transfer to naval air station, Bay Shore, Long Island.

Central Division: Machinists' mates, 900; quartermasters, 900; carpenters' mates, 390; blacksmiths, 30; coppersmiths, 40. First three classes to transfer to naval training station, Great Lakes, Ill., and for further transfer to Dunwoody Institute, Minneapolis, Minn.; coppersmiths and blacksmiths to naval air station, Bay Shore, Long Island.

Southern Division: Machinists, mates, 500; quartermasters, 500; carpenters, 200; blacksmiths, 20; coppersmiths, 20. First three classes to transfer to naval aeronautic station, Pensacola, Fla.; others to naval air station, Bay Shore, Long Island.

Western Division: Machinists' mates, 700; quartermasters, 700; carpenters' mates, 320; blacksmiths, 20; coppersmiths, 40. First three classes to transfer to naval air station, San Diego, Cal., others to naval air station, Bay Shore, Long Island.

New Airship Manual

Despite the voluminous literature on aeronautics both in America and England, no convenient source of information has been available for the student of airships or their pilots or designers. Reliable data has heretofore been widely scattered in many publications and periodicals in English, French, Italian, German, and Spanish. The author of the present volume has performed a valuable service in making an exhaustive search for such informations and presenting it in convenient and attractve form. Many years of patient research both in the early history of the airship



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Allied aeroplanes being shipped to the French front. Official French photo

and recent official publications, are here represented. The volume includes an international register of airships with a compendium of the airships' elemental mechanics. The register although presented with exhaustive detail is tersely worded and will prove invaluable as a work of reference. It includes the worlds air shipping and whenever available complete data for every airship of 500 cubic meters and over that has been laid down since 1834. Smaller airships are listed when they have embodied unusual features.

The student of aeronautics will find the chapter devoted to the elemental mechanics of the airship extremely helpful while to the layman the treatment of the subject makes very interesting reading. Separate chapters are devoted to "The Airships of the Great War," "The World's Airship Builders," "The World's Airship Production," "The Military Airship Fleets," and "The Comparative Strength of the Millitary Airship," which indicate the comprehensive nature of the book. The airship losses both of the Allies and of Germany are given in detail. A study is also included of the commercial airship fleets of 1914 and the world's airship sheds. The statistical data is arranged on convenient tabulated form. The book is profusely illustrated with drawings and some 150 photographs from the private collection of Mr. Henry Woodhouse which make it the most complete work of its nature which has appeared. D'Orcy Airship Manual, compiled and edited by Ladislas D'Orcy. This book can be obtained from The Aeronautic Library, 280 Madison avenue, New York City. The price of the book is $4.25 postpaid.

Special Orders 277

The following named officers of the Medical Reserve Corps, now on duty at the places specified, are assigned, in addition to their other duties, to temporary duty as members of the physical examining units, Aviation Section, Signal Corps, now being established at these places, for the examination of such candidates for the Aviation Section as may be ordered before them: Maj. Edward C. Ellett, Camp Meade, Annapolis Junction, Md.; Maj. Patricinne J. H. Farrell, Camp Travis, Fort Sam Houston, Tex.

First Lieuts. Av. Sec., S. R. C. Martin T. Chamberlin, November 10, 1917, Winthrop P. Buttrick, November 15, 1917; Howard Hare Powell, November 11, 1917, on duty requiring them to participate in aerial flights from dates mentioned.

Second Lieut. Herman C. Meyers, S. C., to Kelly Field, S. San Antonio, Texas.

Second Lieut. Wm. A. Sinclair, Av. Sec., S. R. C., active duty at Morrison, Va.

Second Lieut. Walter R. Shiner, Av. Sec., S. R. C., active duty at Morrison, Va.

First Lieut. Hubert V. Hopkins, S. C., to Camp Custer, Battle Creek, Mich.

Second Lieut. Guy E. Parker, S. R. C., to active duty, Camp Alfred Vail, Little Silver, N. J.



Major Campbell of the British Royal Flying Corps, who is in America helping to establish schools for aerial photography

Second Lieut. Charles S. Dawson, S. R. C., active duty, reporting to Chief Signal Officer of the Army for assignment.

Second Lieuts., S. R. C., Max C. Batsel, Bruce O. Burlingame, Eugene A. Bartelme, Lawrence W. Brunson, and John J. Downing to Chief Signal Officer of the Army for assignment.

Second Lieut. Percy A. Ransome, Av. Sec., S. R. C., active duty at Morrison, Va.

First Lieuts., S. C., to Rockwell Field, San Diego, California, Junius B. Alexander, Geo. C. Furrow, Alman Stroupe, Frank W. Wright, Ernest Clark, Emert Shields, and Arthur A. R. Scheleen.

Second Lieut. Earnest Linkenauger, S. C., to Kelly Field, S. San Antonio, Texas.

First Lieut. Geo. J. Kadel, S. R. C., active duty, Camp Alfred Vail, Little Silver, N. J.

Capt. Walter C. Fisher, Av. Sec., S. R. C., temporary duty at San Francisco, Cal., upon completion, to Salt Lake City, Utah.

First Lieut. Roland G. Blake, Av. Sec., S. R. C., to School of Military Aeronautics, Georgia School of Technology, Atlanta, Ga.



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Group of American airmen under instruction by British officers. British official photo

First Lieut. Bernard Kehoe, S. R. C., to Camp Alfred Vail, Little Silver, N. J.

Capt. Theodore Williams, S. R. C., active duty, reporting to Chief Signal Officer of the Army for assignment.

First Lieut. Jno. M. Clark, Av. Sec., S. R. C., active duty at Kelly Field, South San Antonio, Tex.

First Lieut. W. Scott Schreiner, Av. Sec., S. R. C., active duty at Kelly Field, South San Antonio, Tex.

Capt. Wm. E. Herring, S. R. C., active duty at Ft. Sam Houston, Tex.

First Lieut. Bennet A. Molter, Av. Sec., S. R. C., active duty at Gerstner Field, Lake Charles, La.

First Lieut. Myron M. Ashley, Av. Sec., S. R. C., active duty at Garden City, L. I., N. Y.

Capt. Geo. M. Stratton, Av. Sec., S. R. C., active duty at San Francisco, Cal.

First Lieuts. Av. Sec., S. R. C., active duty at Taliaferro Field, Hicks, Texas, Roland C. W. Blessley, Edward T. Comegys, August L. Grimme, Fred A. Hoover, Paul W. Loudon, Jarvis J. Offutt and George V. Seibold.

Capt. Alfred J. Hightower, Signal Corps, to Chief Signal Officer of the Army for duty.

Capt. Richard Van W. Negley, Av. Sec., S. C., to Kelly Field, South San Antonio, Tex.

First Lieut. Herbert N. Packer, Sanitary Corps, National Army, assigned to aviation section Signal Corps at Millington, Tenn.

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Second Lieut. Robert Ross, Signal Corps, to Garden City, Long Island, New York.

Second Lieut. Gaston O'Brien, Signal Corps, to aviation concentration camp, Morrison, Va.

Capt. Madison Bentley, Signal Corps, to temporary duty, aviation examining board, New York, N. Y.

Second Lieut. Victor Eberhard, Av. Sec., S. R. C., to aviation concentration camp, Morrison, Va.

First Lieut. Hugh Martin, Av. Sec., S. R. C., to concentration camp, Morrison, Va.

Second Lieut. Meredith R. Gardiner, Av. Sec., S. R. C., active duty, Morrison, Va.

First Lieut. Richard H. Dixon, Av. Sec., S. R. C., active duty, Kelly Field, South San Antonio, Texas.

First Lieut. William Ferguson, Av. Sec., S. R. C., active duty concentration camp, Garden City, Long Island, N. Y.

First Lieut. Harry M. Griffin, Av. Sec., S. R. C., concentration camp, Morrison, Va.

First Lieut. Bennet A. Molter, Av. Sec., S. R. C., concentration camp, Garden City, Long Island.

The following named officers, Av. Sec., S. R. C., active duty, Garden City, Long Island, New York: First Lieut. Lenwood Hughes Ott, First Lieut. Ralph C. J. Somers, First Lieut. Horace Jones, First Lieut. Arthur J. Perrault, First Lieut. William Daniel Grant, First Lieut. Wendell A. Robertson, First Lieut. Samuel P. Mandell, First Lieut. Charles W. Wade, First Lieut. Heath A. Melton, First Lieut. Olive R. Lucas, First Lieut. Pearson B. Garrett.

Second Lieuts., Signal Corps, Kelly Field, South San Antonio, Texas, as follows: Edward Schumacker, John Thomas, George Engelhart.

Second Lieut. Richard G. Park, Jr., Av. Sec., S. R. C., active duty, Portland, Oregon.

Capt. Dudley B. Lawrence, Av. Sec., S. R. C., to active duty, New York, N. Y., aviation examining board, 104 Broad Street, for temporary duty, upon completion proceed to Cincinnati, O.

First Lieut. James D. Perry, Av. Sec., S. R. C., to active duty, School for Aerial Observers, Fort Sill, Okla.

Maj. William C. McChord, Av. Sec., S. C., to Chief Signal Officer of Army for duty.

Capt. Reginald H. Barnwell, Av. Sec., S. C., to Portland, Ore., for duty.

First Lieut. Roy C. Tisdale, Av. Sec., S. C., to Portland, Ore.

Major Thomas C. Musgrave, Av. Sec., S. C., to Kelly Field, South San Antonio, Texas.

First Lieut. Robert F. Daggett, Av. Sec., S. R. C., to Morrison, Va.

Lieut. McFarland Hurt.

Dallas, Tex.—Lieut. McFarland of the Royal Flying Corps, stationed at Ft. Worth, was seriously injured and a student aviator, who has not been identified, was probably fatally hurt when an airplane fell 200 feet near Duncanville, southwest of Dallas. McFarland has a chance to recover.

E. B. Hundley, a cadet in the aviation section of the Signal Corps, stationed at Camp Taliaferro, was instantly killed December 1st when he lost control of his plane and fell 2,500 feet. He is said to be a Virginian.

The following-named officers of the Medical Reserve Corps, now on duty at the places specified, are assigned, in addition to their other duties, to temporary duty as members of the physical examining units, Aviation Section, Signal Corps, now being established at these places, for the examination of such candidates for the Aviation Section as may be ordered before them: Maj. William P. Barndollar, Camp Wadsworth, Spartanburg, S. C.; Maj. Roy B. Canfield, Camp Custer, Battle Creek, Mich.; Maj. Ewing W. Day, Camp Lee, Petersburg, Va.; Maj. Edward B. Dench, Camp Upton, Long Island, N. Y.; Maj. Wells P. Eagleton, Camp Dix, Wrightstown, N. J.; Maj. Christian R. Holmes, Camp Sherman, Chillicothe, Ohio; Maj. William F. Knowles, Camp Devens, Ayer, Mass.; Maj. Norval H. Pierce, Camp Grant, Rockford, Ill.; Maj. George B. Wood, Camp Meade, Annapolis Junction, Md.; Capt. Richard S. Anthony, Camp Kearny, Linda Vista, Cal.; Capt. Lewis C. Covington, Camp Cody, Deming, N. Mex.; Capt. John F. Culp, Camp Hancock, Augusta, Ga.; Capt. Theo. Dorsett, Camp Travis, Fort Sam Houston, Tex.; Capt. Ewing F. Howard, Camp Logan, Houston, Tex.; Capt. Robert K. Hutchings, Camp Lewis, American Lake, Wash.; Capt. Albert N. Jacob, Camp Wheeler, Macon, Ga.; Capt. John W. MacConnell, Camp Jackson, Columbia, S. C.; Capt. Walter J. Mathews, Camp Bowie, Fort Worth, Tex.; Capt. Seaton Norman, Camp MacArthur, Waco, Tex.; Capt. Kent E. Williams, Camp Funston, Fort Riley, Kans.; First Lieut. Aaron L. Bishop, Camp McClellan, Anniston, Ala.; First Lieut. Malcolm I. Brewer, Camp Shelby, Hattiesburg, Miss.; First Lieut. Glenn A. Bulson, Camp Gordon, Atlanta, Ga.; First Lieut. Edward E. Evans, Camp Pike, Little Rock, Ark.; First Lieut. Rufus Jackson, Camp Beauregard, Alexandria, La.; First Lieut. Thomas E. McConnell, Camp Greene, Charlotte, N. C.

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The following-named officers, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for duty: First Lieut. Theodore P. Davis, First Lieut. Ralph D. Looney, First Lieut. Max Chapman, First Lieut. James W. Rockwell, First Lieut. Chester T. Crawford, First Lieut. Alexander B. Gray, First Lieut. Robert E. Bowers, First Lieut. John K. Tilton, First Lieut. Edward C. Fisher, First Lieut. James E. Wooley, First Lieut. Charles L. Heyniger, First Lieut. Raymond C. Sanborn, First Lieut. Fenton J. Baker, First Lieut. Dan M. Bell, First Lieut. George F. Howard, First Lieut. Augustus G. Gibbs, First Lieut. Louis E. Lindenmen, First Lieut. Alfred R. Bellinger, First Lieut. Hugh Hartshorne, Jr., First Lieut. Turner B. Neal, First Lieut. Clarence Oliver, First Lieut. Horace E. Westmoreland, First Lieut. Ross G. Scruggs, Second Lieut. Palmer H. Graham.

The travel directed is necessary in the military service.

First Lieut. Albert T. Tebo, Aviation Section, Signal Reserve Corps, is ordered to active duty and will report in person to the commanding officer, Rockwell Field, San Diego, Cal., for assignment to duty.

First Lieuts. George O. Floyd and William G. Martin, Aviation Section, Signal Reserve Corps, are ordered to active duty and will report in person to the commanding officer, School for Aerial Observers, for assignment to duty.

Second Lieut. Thomas F. Burroughs, Aviation Section, Nonflying, Signal Reserve Corps, is ordered to active duty and will proceed to Portland, Ore., and report in person to Col. Brice P. Disque for assignment to duty. The travel directed is necessary in the military service.

The following-named officers of the Signal Reserve Corps are assigned to active duty and will proceed to Little Silver, N. J., and report in person to the commanding officer, Camp Alfred Vail, that place, for assignment to duty: First Lieut. George N. Saurwein, First Lieut. Paul S. Clapp, First Lieut. Arthur W. Horne, First Lieut. William S. McDermott, First Lieut. John C. Beall, Second Lieut. Perry J. Edwards, Second Lieut. Guy C. Mallett, Second Lieut. Ransom H. Bemian, Second Lieut. Walter W. Boes, Second Lieut. Max F. Stueber, Second Lieut. Ernest R. Tilton, Jr., Second Lieut. Richard S. Ashley, Second Lieut. Guy E. Parker, Second Lieut. Horace Platt.

Leave of absence for 10 days is granted Maj. Ira Longanecker, Signal Corps.

The following-named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Camp Greenleaf, Fort Oglethorpe, Ga., and will proceed to Montgomery, Ala., and report in person to the commanding officer, aviation mobilization camp, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: First Lieut. Bruce H. Beeler, First Lieut. John M. Beggs, First Lieut. Max Dobrin, First Lieut. Hiram S. Eggers, First Lieut. Albon E. Fichtner, First Lieut. Perry L. Helmick, First Lieut. Alexander B. Kalbaugh. The travel directed is necessary in the military service.

The following-named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Riley, Kans., and will proceed to Montgomery, Ala., and report in person to the commanding officer, aviation mobilization camp, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: First Lieut. Edward P. Evans, First Lieut. Wylie R. Felts, First Lieut. Francis X. Hartigan, First Lieut. Raymond A. Hebron, First Lieut. Frank Hedges, First Lieut. William L. Howell, First Lieut. Robert A. Irvin, First Lieut. Benjamin W. Kelly, First Lieut. Albert H. Kulig, First Lieut. William H. Meddaugh, First Lieut. Irvin C. Munger, First Lieut. Charles M. Pearson, First Lieut. Roscoe D. Taylor, First Lieut. John H. Timberman, First Lieut. Thomas S. Venard, First Lieut. Athol H. Wedge, First Lieut. Edward C. Wittwer.

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Second Lieut. Max A. Montgomery, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for duty. The travel directed is necessary in the military service.

First Lieut. Lucian L. McLean, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to South San Antonio, Tex., and report in person to the commanding officer, Kelly Field, for duty. The travel directed is necessary in the military service.



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The Aero Club of France has awarded gold medals to the following aviators: Capt. Personne and the "aces" (men who have brought down five enemy aeroplanes), Ortole, and Chaput. From left to right, seated, Personne, Lieut. Ballacg, M. Dutch de la Marthe, Senator Gaston Menier, and M. L. Weiller, member of the Chamber of Deputies. Standing, Ortole, Chaput, Dascher, Commander Malherbe, M. d'Aubigny, Pegut, Apeil, Lt. Thierny (Navy), Commander Lechere, Chief of the air service of Paris

ARTILLERY CAMOUFLAGE ON THE WESTERN FRONT

By JOSEPH WHITNEY-GANSON, An American Officer in the French Artillery*

IT is axiomatic for an artillery officer to hide all traces of his men and position. Hence has arisen a system of "camouflage," to use military slang. One uses all means to disguise a gun, an observatory, or wagons and the like. The material employed is "saffia," which has the disadvantage of being slightly transparent at a distance, showing the shadows of a cannon to be concealed. Linen is cut into various forms and smeared with paint. But spontaneous combustion is an enemy, too, for the paint has a base which ignites readily.

Enemy aeroplanes are everywhere, taking photographs in spite of anti-aircraft guns and aeroplanes on guard. Photographs play an enormous part. Things look different at a high altitude. Shadows are emphasized, colors change. In outlining a defensive work, aerial photographs should be taken at various stages and examined with a magnifying glass, so as to be sure that an enemy photograph may display nothing indiscreet.

A large strip of linen, although in color harmony with the surroundings, often reflects so much light as to be quite evident in a photograph. If the linen be wet, it becomes a mirror. Black surfaces reflect so much light that they are quite apparent to the aerial observer. Blue appears white. Neutral gray is the best disguise for a wagon, because of the diminished reflection.

The time of day changes natural colors at a distance. A wood may be green in the early morning, blue at noon, and violet at night. There is a radiation peculiar to each material, and the artist disguising military constructions must be conversant with many laws of optics. The earth is an excellent reflector, while certain disguising materials are not. Hence a contrast against the surroundings is quite evident in a photograph.

Flat surfaces are dangerous. Branches of trees thrown carelessly over a trench show plainly in a photograph, whereas, if they are set upright in a natural position, the extremities give the effect of stippling, and the betraying traces are hidden.

Tufts of grass can be scattered irregularly. They give a better disguise than if spread solidly. A path is a dangerous indication. Telephone wires often show because the men making repairs leave a sort of path. Telephone wires converging show a central station with the probability of a battery near at hand. In a photograph white oval-shaped spots appear under the muzzles of guns where the hot breath of the cannon has scorched the earth. Four of these tiny spots on a photograph placed under the magnifying glass are sure evidence of a battery. They can be imitated advantageously for a false battery.

Photographs taken at a high altitude have characteristic lines and shadows not appreciable to a layman. But the use of a stereoscope brings certain objects into relief. Photographs taken of the enemy's lines from day to day show infinitesimal changes which are evidence of construction under progress.

But shadows at 8 o'clock are different from shadows at noon, and the photographs should be marked with the hour of exposure and the direction of the north, so that the angle of light may be estimated.

Photographs are useful as a posteriori evidence of precision in bombardment. A gun has many elements of imprecision, no two shots falling in the same place, although every human and scientific precaution has been taken in the aim and the charge employed. Hence it often takes 600 shots to destroy a position, because apparently they are delivered blindly. But there are laws from which the proportion of true hits can be estimated. Given the proper amount of ammunition, regardless of expense, and our French artillery officers can guarantee any results required.

If a trench, which has been properly concealed, is entered by a slanting hole, the shadow shows up in a photograph. But if the entrance is constructed in the perpendicular plane it is less evident in the picture. An observation post often is marked in the photograph by a conspicuous shadow at the window, where the observer is posted. But this shadow can be dispelled or broken up by a coarse network of wire. The network does not hinder the observer, but it renders the aperture invisible at a great distance.

Photographs taken of a disguised position in a wood, compared with previous photographs, show an effect of something having grown quickly. Hence the advisability of taking photographs constantly. They are the eyes of the artillery officer and reveal almost every movement of any consequence.

The paths used permanently should never show the true direction of the post or position. A path should not have a perpendicular approach. It should be oblique and go beyond its object.



Setting a big gun in a new position, small trees hide the gun from aeroplane observers

* Courtesy of the New York *Times*.



A heavy French artillery gun protected from aeroplane observation by an overhead bower of twigs which, when photographed from above, does not betray the gunners' position to the enemy observers

SCOPE OF CIVIL AERIAL TRANSPORT COMMITTEE

THE following interview was authorized by Dr. W. F. Durand, Chairman of the National Advisory Committee for Aeronautics, on the origin, scope, and plans of the new Civil Aerial Transport Committee which supersedes with sands of men now going into the Air Service, Committee authorized on December 7, 1916. The new committee was organized November 17, 1917, under the National Advisory Committee for Aeronautics and will proceed without delay to take under consideration the many important questions which lie within the scope of its activites.

"The future of aviation is of vital importance even at the present time, because upon it depends very largely the future of the thousands of men now gong into the Air Service, the millions of dollars allotted to it by Congress and by industry, and in general, the possibility of salvaging the present investment in aviation expressed in terms of human energy, skilled workmen, trained aviators, time and capital.

"What, for instance, are we going to do after the war with the thousands of fliers and of planes on hand, with the factories tuned up for vast quantity production, and with the great training schools and fields with their capacity for turning out aviators? So far as humanly possible, plans should now be laid looking toward the utilization of all these as the nucleus of a future aviation development which will serve to open up a new avenue for man's activities and enormously widen his vision and capacities. Already planes have been built to carry 25 passengers to travel at a speed of 150 miles an hour; to ascend 4½ miles into the air; to cover 920 miles without a stop, as against the longest non-stop distance across the Atlantic of 1195 miles from New Foundland to the Azores.

"Peace will find this country with an immense air capital on hand, and comprising skilled workmen, factories, machinery and industrial organization in effective operation. This capital must be so conserved and directed that, if possible, not a man or a dollar will be wasted in the hiatus between war and peace. The situation at the termination of hostilities must be foreseen so far as humanly possible and plans laid in advance in order that we may then avoid hasty and ill-advised measures.

"Europe has already gone a long way in such pre-vision. Aviation there is almost as old as the war, and is, in a sense, bred into the bone. The moment the war is ended, there will be ready a complete plan for the conversion of all this equipment to the uses of peace and commerce. France set up such a committee in January last, and England followed shortly with a body headed by Lord Northcliffe. Bavaria has outlined an aerial traffic system for Central Europe, and Germany, a Hamburg-to-Constantinople route. One of our first steps, of course, has been to get in touch with the allied committees in order to secure the value of their experience and to plan for the complex international phases of the situation.

"One of the most important of the many problems pressing for consideration is the human one of what is to become of airmen. Not only will these men deserve well of their country, but in self-interest the country must safeguard a skill which is both rare and costly. They not only deserve opportunities for further service in peaceful vocations, but it is an economic necessity that they should have the opportunity of continuing to serve along lines which will secure some return on the national investment which they represent. There will be many such lines of service, whether in the army, in aerial mail, coast guard, air policing, scientific investigation, or in the training of new aviators.

"The new industry also, which has grown up under Government inspiration, should be protected against sudden stoppage of war orders. If when peace comes, a few months are allowed to pass without new business, the industry which has been built up with such care would be seriously crippled. The vast army of workmen required under present conditions will be thrown out of employment and will be forced to seek opportunity elsewhere, thus adding to the industrial confusion which must be anticipated in the readjustment between war and peace. One of our problems will be to find means of minimizing the ill effects of such readjustments possibly by having plans for peace planes for mails, coast guard, policing, and mapping, so up to date that when war orders stop the industry may change over with the minimum disturbance to the more permanent work ahead.

"The first and more obvious use of airplanes in the future lies in the delivery of mails. Already Congress has appropriated $100,000 for the initial steps in aerial mail delivery, but for the present all manufacturing energies must go into the war planes.

(*Continued on page 617*)

Often a cable can be rigged to carry ammunition, provisions, &c.

Sometimes disguising, carried too far, is evident in the photograph. Those who know German psychology say that frequently a frank display of positions fools the boches, and that they get less of their share of bombarding than some of the disguised positions, because the Germans think them only a pretense.

One has to study the German plan of offense and defense to understand or anticipate where mitrailleuses might be found in the photographs. There are logical positions which Germans would hold, and experience shows that a bombardment of these positions is often effective on general principles.

Telephones and stations with optical apparatus are good objectives. Paths, spots showing in the photographs, shadows which do not belong there, all make good targets. Openings in the countless barriers of barbed wire must be disguised against the all-seeing camera.

If there is a circulation of soldiers about a depot of munitions it is shown by a photograph. Railroads are fair targets. Wherever a switch is shown by the photograph it is fair to assume that that spot is important to the enemy. Hence a good dose of shell.

The French do not scatter shots on general principles. A systematic scheme of placing one shot after another until possibly sixty have fallen on or about one spot assures complete destruction of the work in evidence. We do nothing half way. Stations for provisions, stations where troops are disembarked, parallel lines, and narrow-gauge lines leading to ammunition stores, have characteristic black and white marks on the photograph.

So, on the Directing Map, the range is projected and calculated at distances where the eye alone is useless.

Aerial observation of necessity must be rapid, because of the many obvious perils. Taking photographs today has become the rule for every machine. They are rapidly developed and studied by experts at headquarters. Then, when the results have been reconstituted, copies are sent wherever appropriate. The object of the artillery is to destroy enemy positions. An aeroplane is a tremendous aid in regulating fire. The fact that the target cannot be seen by the range finder is not so important, because the military map drawn up from day to day gives accurate measurements of distance and direction.

However exact are the calculations for angle of fire, it must be remembered that there are elements in fire which cannot be accurately controlled. Hence, although all conditions appear to be the same in ten consecutive shots—such as temperature, wind, weight of projectiles, density, of air, &c.—not one of the ten shots will fall in exactly the same place. There may be a difference in polish of the projectile, which affects the resistance of the air. There may be an unappreciable difference in the humidity of the powder, which affects initial velocity, and, consequently, range. There may have been a slight settling to one side of the platform of the wheels of the cannon affecting the direction. The charger may have rammed the projectile into the cannon with a little less vigor and precision, so gas has escaped and velocity been affected. Without going into all uncontrollable elements producing inaccuracy, it is evident that, in the ten shots, there are sufficient differences at the cannon to produce errors of more or less extent at the target.

These differences are subject to the operation of mathematical law. When once the aeroplane observer perceives how shots are falling he can send in directions. Owing to his great height it is not absolutely necessary to be in a vertical plane of observation, so time and safety are assured. The essential for the observer is to obtain the proportion between the shots which fall long and those which fall short, fired in one series on one angle. Then the commanding officer can regulate the change of angle of fire and direction, according to rules carefully worked out.

In conducting the regulation of the range on one objective often sixty shots must be fired. When projectiles are running from 35 to 1,200 francs, it takes a long purse to gain control of fire. To destroy certain objectives 600 shots must be placed. Shots fired at random are lost. The result is zero when the commanding officer is tempted to take short cuts in establishing his angle of fire, for a certain number of shots, long and short, must be obtained to give play to the operation of certain "laws of probability," before he can determine just how near he is to the center of the target.

Communication from the aeroplane is by wireless. The "antennae" of the receiver on earth should be far from any crest or cover of earth which would intercept the waves from the aerial apparatus.

The battery communicates with the aeroplane by means of signals displayed. Squares of white cloth, several yards long, are handled by trained men. To the observer at two or three thousand yards of altitude, these squares look to be a matter of inches. Evidently these must be placed on a dark background to be seen clearly. Some officers have made the mistake of placing them just below the crest of a hill, so that they could not be observed by the enemy. But in that case they are equally hidden from the allied observer, who must spend twenty minutes sometimes in flying back to gain an angle where he can see his own signals on the earth. The best place is in the middle of a field not near any conspicuous object which could be used by the enemy to regulate fire.

The wireless should not be close to the battery. It can be seen from an aeroplane and attracts fire. Each battery must have its place for signals numbered and lettered in code so that the aerial observer may make no mistakes in getting into communication. He has his charts, which are compared daily with those of the batteries to which he is sent. Intersecting lines determine the points on the earth. A signal ten yards square is not easily seen, so the number of the co-ordinates, or intersecting lines, is given in code.

It is a comparatively simple matter to train men to receive the wireless and it is the duty of the officer who is in charge of the wireless communications of the battery to have a crew in readiness. It is a mistake to think one can correspond at night with aerial observers by means of searchlights on the earth.

In working with aerial observers time must be saved, so the pointers at the cannon must be thoroughly trained. The cannon must be fired at a fixed cadence of so many seconds' interval between shots, so that the aerial observer can distinguish a particular battery among scores of others. The battery must fire at the instant the command is given from the aeroplane—otherwise observation is hindered.

These are merely a few notes on some of the problems before an artilleryman.



Russian Anti-aircraft guns camouflaged by striping the barrels which, when seen from a distance, blend with the surrounding landscape

STABILITY IN GENERAL*

By HARLAN D. FOWLER, Aeronautical Engineer

Foreword:

THE problems of stability as investigated during the last five years, while being of tremendous value to the designer, still has a great deal of matter to be solved. In spite of the strenuous efforts put forth to discover the underlying factors tending to create instability there still remains two forms of instability, the "spiral instability" and the "nose

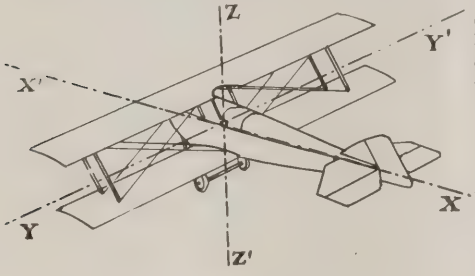


Figure 1

dive," both forms of which are largely responsible for many unknown causes of accidents. Much co-operation between the laboratories and pilots of machines will have to take place before a true solution of the above problems is accomplished.

In taking up the study of stability, we must realize that to secure exactness in its solution is impossible at the present stage of investigations. However, we are in a far better position to accomplish a large portion of its solution than the pioneers who first attempted to fly, without any knowledge whatever of the rudiments of stability. But for this factor alone the advance of aeroplane development would have been many years ahead of the present type.

Consideration of stability on all the present forms of aircraft will be made here, giving first a mathematical solution, and then the laboratory solution.

STABILITY

Definition of Stability

In mathematical theory the term stability is used in its simplest sense, and is defined as the quality of an aircraft in flight which causes it to return to a condition of equilibrium when meeting a disturbance. If a body be moving in any uniform manner relative to the surrounding medium, the motion is said to be stable, if, when any small disturbance occurs, the forces and reactions set up tend to restore the original state of motion. If the forces due to a small initial disturbance tend to produce a further departure from the original state of motion, the motion is said to be unstable. When there is no tendency to revert to, or depart from, the original state, the condition may be described as "indifferent" or "neutral."

All departures from the original state of motion may not be of equal importance. Thus, for an aeroplane, a disturbance which merely changes the direction of motion in the horizontal plane will not, in itself, endanger the safety of the machine, and complete indifference as regards such a disturbance may be advantageous for steering. Account must be taken, therefore, of the nature of the departure or disturbances.

It may be remarked that the above definition presupposes an external disturbance, with no change in the moving body. An aeroplane may be subject to an internal disturbance such as failure of the motor, or change in the position of load carried.

It will be noted that the definition is limited to small departures from the state of steady motion. In practical application of the mathematical theory of stability the term small must be interpreted by examination of numerical values in each particular case. Again, the definition presumes that any disturbance of the medium is only temporary and tends to die out; the definition is no longer directly applicable if the medium itself is subject to continuous disturbance.

When disturbance of a stable motion occurs oscillations are often set up. Owing to dissipation of energy these will "decay" more or less rapidly; they are said to be "damped." The damping may be so great that the return to the original condition occurs without excursion beyond it; the motion is then called "deadbeat."

It is probable that our present knowledge is sufficient to enable an aeroplane to be so constructed that it shall have both longitudinal and lateral stability. From what has already been said, however, it will be understood that the problem to be dealt with is more difficult than this. It is clearly possible that a machine may be *over*-stable; it then becomes insensitive to control, and will not steer readily; and is liable to behave unsatisfactorily in gusty winds, owing to a tendency to change of attitude with every change in the relative wind. The view now generally held is that it is necessary that the machine should be stable, but not *too* stable.

The degree of stability desirable cannot as yet be exactly specified, and the knowledge can only be obtained from the experience of pilots in flight. The degree of stability necessary will, of course, be different in relation to different types of disturbance; while marked stability as regards maintenance of speed may be found to be essential, "indifference" to yawing is probably desirable, and a near approach to neutrality as regards rolling may be no disadvantage.

It is clear that in order to be able to design a machine so as to secure an approach to neutrality, the aerodynamic forces and reactions for the various parts of the machine must be known with considerable accuracy. It is only possible to obtain this knowledge by experiments directed specially to this end, and such experiments must be conducted on models. The general results must, of course, be verified by experience with full-scale machines; but model experiments are specially adapted for obtaining information of this character, and the expense of carrying out such work on the full scale would not only be prohibitive, but unnecessary.

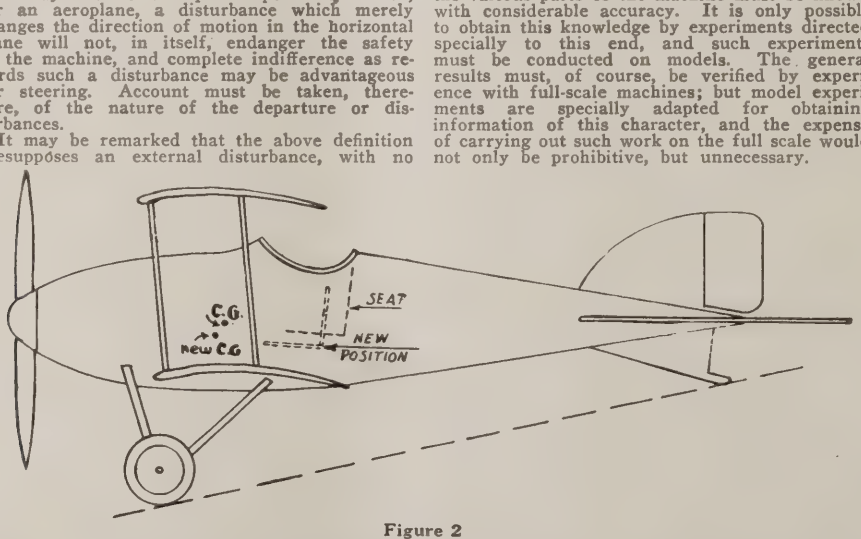


Figure 2

It is clear that until the data that will be furnished by such experiments are available, rapid progress towards the ideal conditions is not possible. In practice, the present position is that several methods are known by which improvement in the direction of increased stability may be obtained, but the amount of improvement due to any given alteration is uncertain, and the effect of such alteration on other aerodynamic qualities of the machine is unknown.

The consideration of wind fluctuations introduces a new element in the problem. It is conceivable that a stable aeroplane might, under repeated disturbances due to wind gust, develop dangerous oscillations; or since the stable machine tends to take up a definite attitude towards the relative wind, it may be perpetually turning to face the wind gusts, causing discomfort and inconvenience to the flier, and becoming difficult to steer and to control.

One factor tending, under certain conditions, to counteract the effect of gusts is speed. The machine designed for high speed will be proportionately less affected by gusts than the low-speed machine. It is noteworthy, however, that in a variable speed machine the pilot always prefers to fly at a low speed in a gusty wind. This is explained by the fact that while in horizontal flight, the effect of horizontal gusts are taken up by the speed of the aeroplane, while the vertical gusts are made more effectual by the downward velocity of the air caused by the inclination of the wings, this downward velocity increases with speed. For equal velocity of the horizontal and vertical gusts the accelerations due to the upward gust will be from three to five times as great as those due to horizontal gusts. Under this state of condition flying at slow speed will be much less disturbed than flying at high speed.

In regard to motion in the longitudinal plane of symmetry, instability occurs in connection with a rising and falling motion which increases in violence and is accompanied by equally violent pitching. This is avoided by the use of a sufficiently large tail-plane, and does not appear to be a prevalent source of difficulty.

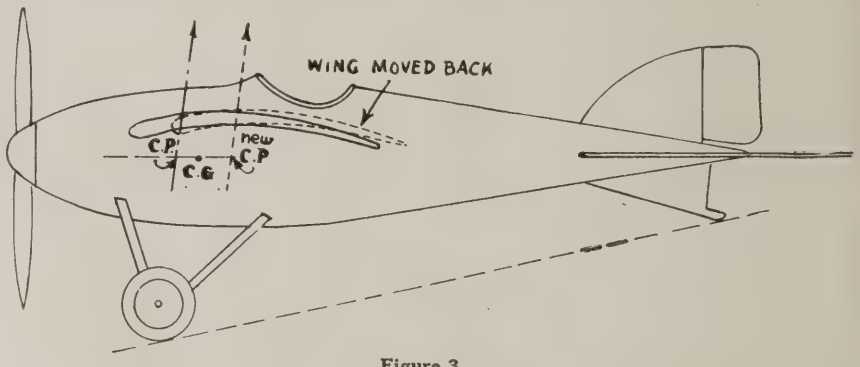


Figure 3

As regards the lateral or asymmetric motion, the dangerous form of instability is that which leads to what is commonly known as the spiral dive. The correction of this defect would appear at present to be the most difficult, and at the same time the most important of the problems connected with stability. The desired result can probably be secured by properly placed fins; it would appear that care must be taken to avoid the use of too large a vertical rudder (for horizonial steering), and attention must be paid to the effect of covering-in the body, which produces the equivalent of fin area behind the center of gravity of the machine.

Gyroscopic action, produced by a rotary engine and its propeller, on stability is not of serious consequence, and negligible on a twin-motor aeroplane.

An aeroplane or airship in flight has six degrees of freedom, three of translation and three of rotation, and any study of its behavior must be based on the determination of three forces—vertical, transverse, and longitudinal—as well as couples about the three axes in space. The longitudinal axis is the fore and aft length and is referred to as the X axis; the vertical axis is perpendicular to this in the plane of symmetry, and known as the Z axis; and the transverse axis is called the athwartship axis, being perpendicular to the other two, and called the Y axis.

When rotation takes place about the X axis, such movement is termed the rolling moment and is measured by the angle of roll; rotation about the Z axis is termed the yawing moment and is measured by the angle of yaw; and rotation about the Y axis is called the pitching moment and is measured by the angle of pitch.

Forces are positive when acting along the positive directions of the axes, angles and moments are positive when turning occurs or tends to occur from OY to OZ, OZ to OX, and OX to OY. (See Fig. 1.) In this work all bodies are drawn to face the left so that all positive movement will rotate clockwise.

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Method of Procedure

In carrying out the design for stability to a successful achievement, recourse must be had to results of tests made on models, whether on parts of aeroplanes or on the complete aeroplane. If a test on a model of a complete machine cannot be had, it will be necessary to calculate the effect each part of a machine will have on the final equilibrium of the complete aeroplane.

The initial step to the acquirement of stability by the method of mathematical calculations will be explained first, so that a clearer conception may be had of the action of the forces that act upon the aeroplane, and the importance of their point of application for ensuring stable flight. For a preliminary design this method is the best, as it permits of greater freedom in bringing the various forces to act at their proper position.

After having made the above calculations, a complete model may be constructed and a thorough test made. Then, if any defect arises, a knowledge of the fundamentals of equilibrium will assist greatly in making suitable corrections.

It is to be frankly admitted that too much reliance on the results of these wind tunnel tests should not be placed, as the actual flying done by the aeroplane in free space cannot be compared with the comparative pacific conditions attending laboratory tests. The actual flying tests may respond to all the characteristics previously predicted, or they may all fall short. However, in all cases it is better to have tests on models carried out, as then a great deal of uncertainty will be placed aside. With the progress and experience gained in extensive tests carried out in the laboratory even this uncertainty will, in time, be mastered and more reliance on the final results may then be placed.

The theory of the stability and equilibrium is applicable to the two general classes of aircraft, the aeroplane and the seaplane; and the kite-balloon and the dirigible in regard to the maintenance of stable flight in free air. The control mechanisms in universal use are the rudder, elevator and ailerons for the first class, and the rudder, elevator and ballonet for the latter class, through whose actions equilibrium is attained. The balloon was not mentioned in the latter class because it is simply a floating body, with no mechanical means of controlling itself beyond that of the vertical plane.

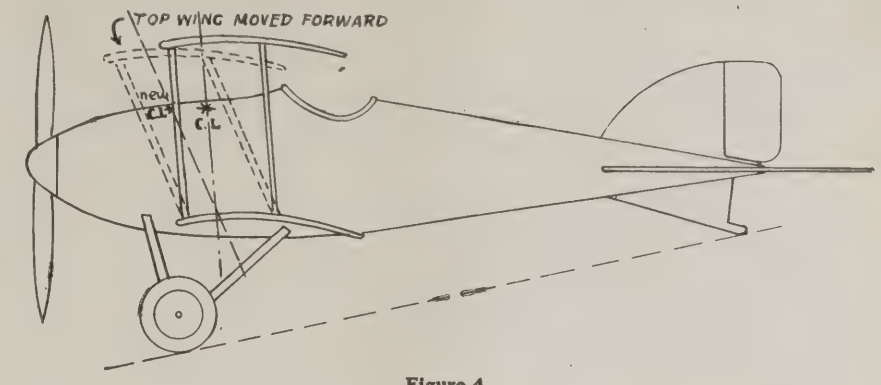


Figure 4

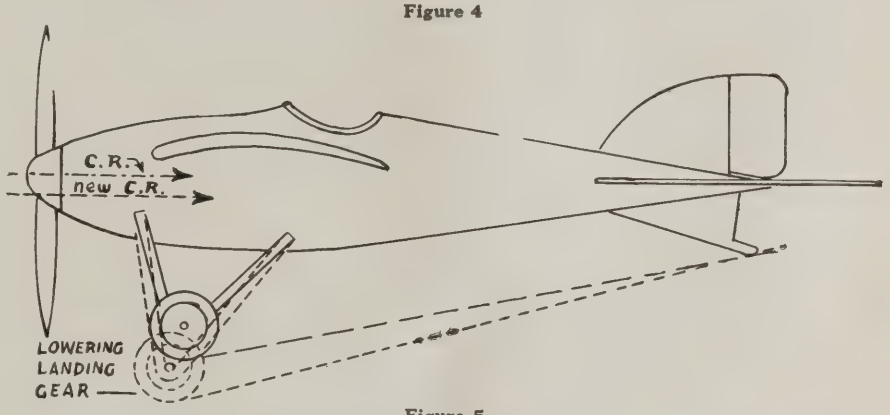


Figure 5

Factors to Be Considered

The stability of an aeroplane is determined greatly by the proper positioning of the following center of applications: The center of gravity (*C.G.*), the center of the pressure (*C.P.*), center of lift (*C.L.*), the center of resistance (*C.R.*), the center of area (*C.A.*), and the center of thrust (*C.T.*), all considered as one separate point on the complete machine, *e. g.*, the *C.G.* of the entire aeroplane, not a part of the aeroplane.

The *C.G.* is a point in a body where the line of action of the resultant of weights of particles contained in the aeroplane passes through. The suitable point of the *C.G.* for the complete machine is accomplished principally by shifting the weight of the pilot, passenger, or gunner or observer, the fuel, the ammunitions, or any heavy movable body not a part of the actual construction. The shifting may take place in a vertical, longitudinal or transverse plane. Thus (Fig. 2) the pilot's seat has been moved forward and lowered, with the consequent result that the *C.G.* has shifted to the position indicated.

The *C.P.* is a point where the resultant of the lift and drift components of a wing or dirigible is situated. The proper position of the *C.P.* on an aeroplane, relative to the *C.G.*, is placed by moving the wings along the longitudinal axis, either by shifting the top wing, or the bottom wing, or the entire wing, or by incorporating a sweepback. In Fig. 3 is shown a monoplane wing whose *C.P.* is forward of the *C.G.* By moving the entire wing back the new *C.P.* is to the rear of the *C.G.*

The *C.L.*, exclusively applied in multiplanes—being a broader term of the *C.P.*—is a point in a line connecting the *C.P.* of each wing, and through which point the resultant force of the lift and drift components and the resistance of the entire wing spread is acting. The alteration of the gap, the aspect ratio, the dihedral, or the stagger are the principal changes to be made when a change of the *C.L.* is desired. In the case illustrated in Fig. 4, the top wing has been moved forward, relative to the lower wing. In this position and with the attending increase in efficiency, due to the stagger, the *C.L.* is further forward and higher than in the previous situation. In regard to the span of the wing the *C.L.* is situated at the center, and its position is shifted to that side where the wing is raised, the lower side of the wing having the least pressure.

The *C.R.* is a point in an aeroplane where the line of action of the resultant of the air resistance of all parts is considered concentrated. The change of position of any body or wing surface exposed to the wind will assist in securing a new position of the *C.R.* Strictly speaking, the *C.R.* is referred to the vertical axis. Lowering the landing gear will tend to alter the position of the *C.R.* (Fig. 5) though very slightly.

The *C.A.* is that point on an aeroplane where the line of action of the resultant of all effective projected area in one plane is centered. Shifting the *C.A.* is done by moving any surface whose side area is exposed to the wind along the same plane, such as enlarging the rudder or putting a dihedral or cathedral to the wings. In practice, the *C.A.* is referred to the side of a body. The addition of fins to the top of the

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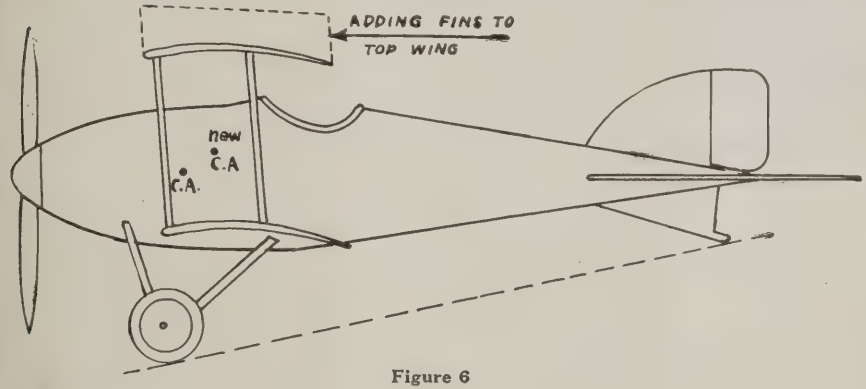


Figure 6

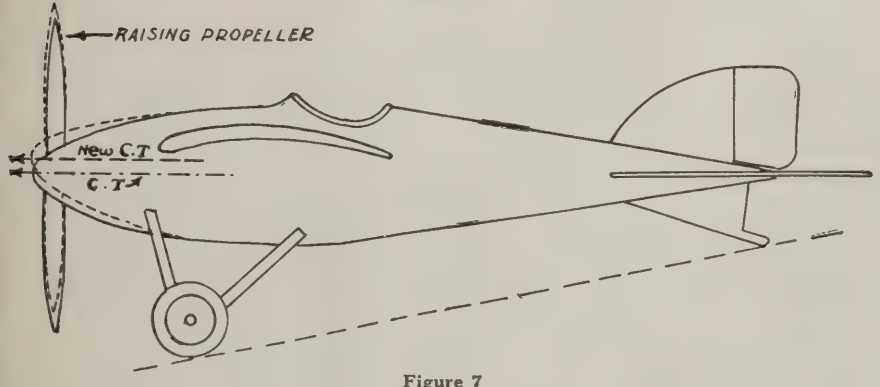


Figure 7

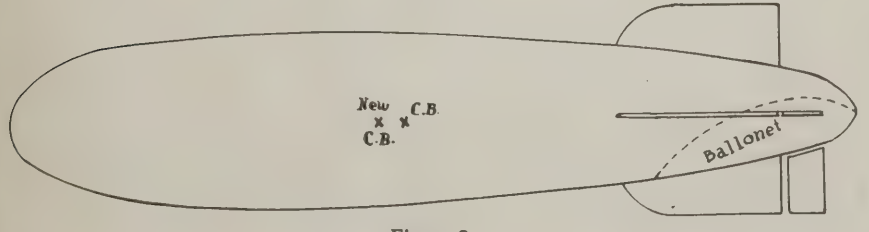


Figure 8

AVIATION ENGINE DEVELOPMENT

By E. H. SHERBONDY*

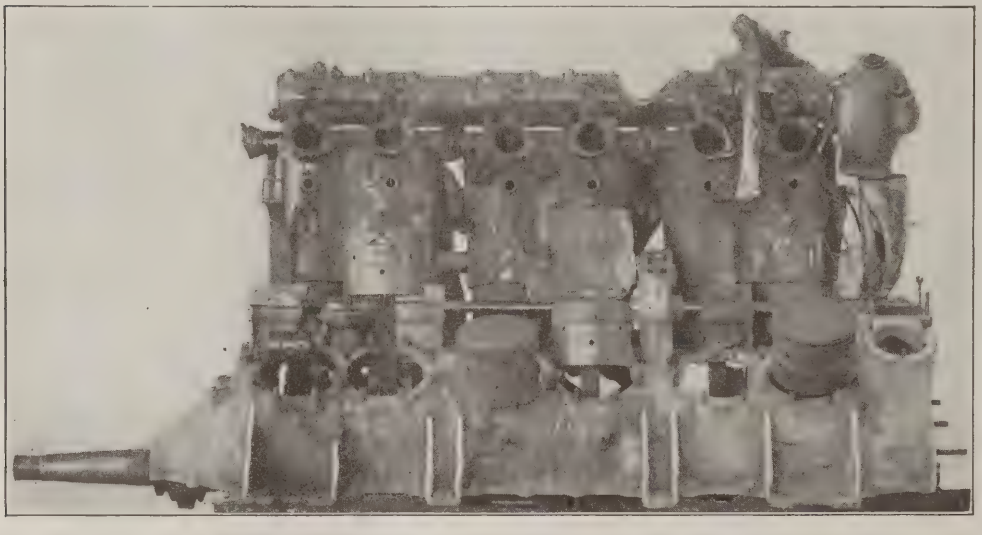
(*Continued from page* 567)

Sunbeam Aviation Engine

The Sunbeam engine has been developed by Louis Coatalen. At the opening of the war the largest size was 225 hp., was of the L-head type having a single camshaft for operating valves and was an evolution from the 12-cylinder racing car the Sunbeam Company had previously built. Since 1914 the Sunbeam Company has produced engines of six, eight, twelve and eighteen cylinders of from 150 to 500 hp. with both iron and aluminum cylinders.

For the last two years all the engines have had overhead camshafts with a separate shaft for operating the intake and exhaust valves. The camshafts are connected through to the crankshaft by a train of spur gears, each of which is mounted on two double-row ball bearings.

In the twelve-cylinder, 350-hp. engine, operating at 2100 r.p.m., it requires about 4 hp. to operate the camshafts. This engine gives 362 hp. at 2100 r.p.m. and has a fuel consumption of 0.51 lb. per b. hp. per hp. The cylinders are 110 by 160-mm.



Renault twelve-cylinder engine

The same design has been expanded into an 18-cylinder, which gives 525 hp. at 2100 r.p.m.

There has also been developed a successful eight-cylinder engine rated at 220 hp., which has a bore and stroke of 120 and 130 mm., and weighs 450 lb. This engine is of an aluminum-block construction with steel sleeves inserted. Three valves are used, one for the inlet and two for the exhaust. One camshaft operates the three valves. This is also being produced by the Austin Motor Company.

The modern Sunbeam engines operate with a mean effective pressure of 135 lb. and with a compression ratio of 6 to 1 at sea level. The connecting-rods are of the articulated type as in the Renault engine, and are very short. These engines weigh 2.6 lb. per b. hp., and can go through a 100-hr. test without trouble. The lubricating system comprises a dry base and oil-pump for drawing the oil off from the base, whence it is delivered to the filter and cooling system.

It then is pumped by a separate high-pressure gear-pump through the entire engine. In these larger European engines, castor oil is used largely for lubrication. It is said that without the use of castor oil it is impossible to hold full power for five hours.

Curtiss Engine

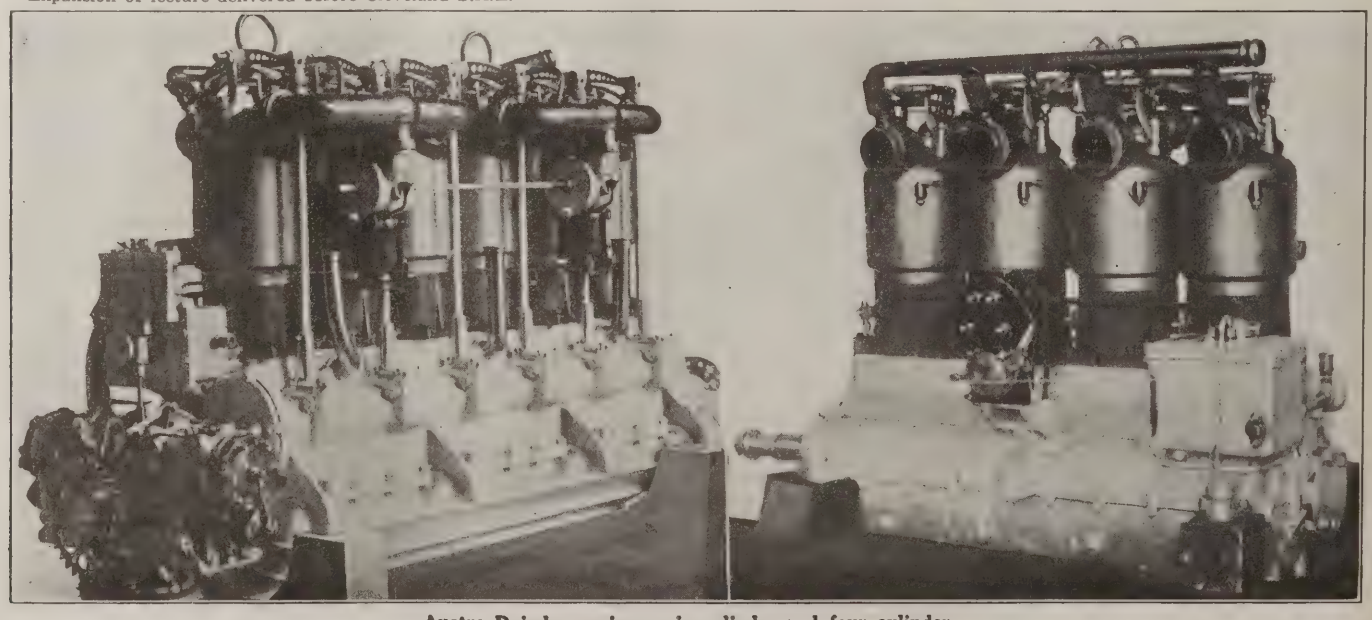
The Curtiss OX engine has eight cylinders, 4-in. bore, 5-in. stroke, delivers 90 h.p. at 1400 r.p.m., and weighs 4.17 lb. p. It has cast-iron cylinders with monel-metal jackets, over-head inclined valves operated by two rocker-arms, push and pull-rods from the central camshaft located in the crankcase. The cam and push-rod design is extremely ingenious and the whole valve construction is very light.

This engine is an evolution from the early type, which was used by Glenn Curtiss when he won the Gordon Bennett Cup at Rheims.

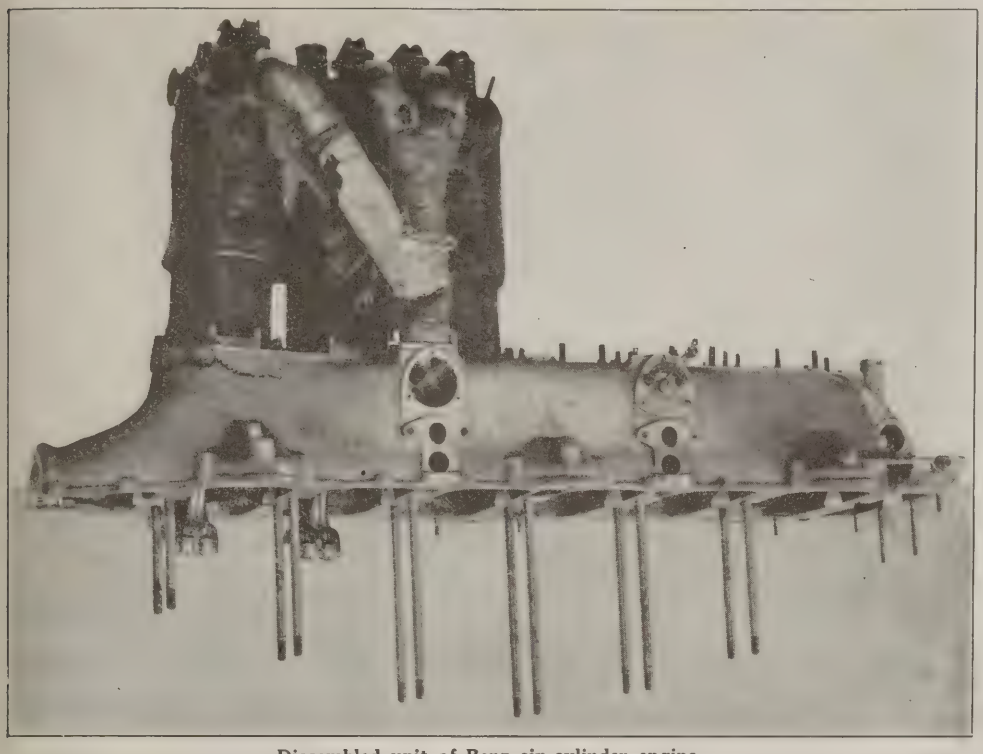
A slightly larger edition of this type is the OXX, which has cylinders 4¼ by 5 in., delivers 100 h.p. at 1400 r.p.m. and has the same fuel and oil consumption as the OX type engine, namely 06 lb. of fuel per b.h.p. per hr., and 0.03 lb. of lubrication oil per b.h.p. per hr.

The Curtiss Company has developed in the last two years a larger size engine now known as V-2, which was originally rated at 160 hp., and which has since been improved so that it gives 220 hp. at 1400 r.p.m., with a fuel consumption of 0.52 lb. per b. hp. per hr. and an oil consumption of 0.03 lb. per b. hp. per hr. This larger engine has a weight of 3.45 lb. per hp. and is said to be giving satisfactory service. It has drawn steel cylinders with a steel water-jacket top and a monel-metal cylindrical jacket, both of which are brazed on to the cylinder barrel itself.

* Expansion of lecture delivered before Cleveland S.A.E.



Austro Daimler engines—six cylinder and four cylinder



Dissembled unit of Benz six-cylinder engine

Both these engines use side-by-side connecting-rods and fully forced lubrication. The camshafts act as a gallery from which the oil is distributed to the camshaft bearings, the crankshaft bearings, and the gearing. Here again we find extremely short rods, which, as before mentioned, enable the height and the consequent weight of construction to be much reduced. For ordinary flying at altitudes of five to six trousand feet, the engines are sent out with an aluminum liner, bolted between the cylinder and the crankcase in order to give a compression radio that does not result in preignition at a low altitude. For high flying, however, these aluminum liners are taken out and the compression volume is decreased to about 18.6 per cent of the total volume.

The V-2 Curtiss engine has been built in a twelve-cylinder design which gives 350 hp. at about 1600 r.p.m. Glenn Curtiss mounted one of these engines in a hydroplane boat and obtained a phenomenal speed of 66 m.p.h. The Curtiss Company is arranging to turn out 1,500 planes a month at its various plants, which gives some idea of the progress that is being made in getting out the quantity of aeroplanes.

Austro-Daimler Engine

One of the first successful flying engines developed in Europe is the Austro-Daimler, which was built after the designs of Herr Porsche. The first of these had four cylinders, 120 by 140 mm. bore and stroke, with cast-iron cylinders, overhead valves operated by means of a single rocker-arm, controlled by two cams. The valves were closed by a single-leaf spring which oscillated with the rocker-arm. The cylinders were cast singly, and had either copper or steel jackets applied to them.

The four-cylinder design was afterward expanded into the six-cylinder design and still later a six-cylinder engine of 130 by 175 mm. was developed.

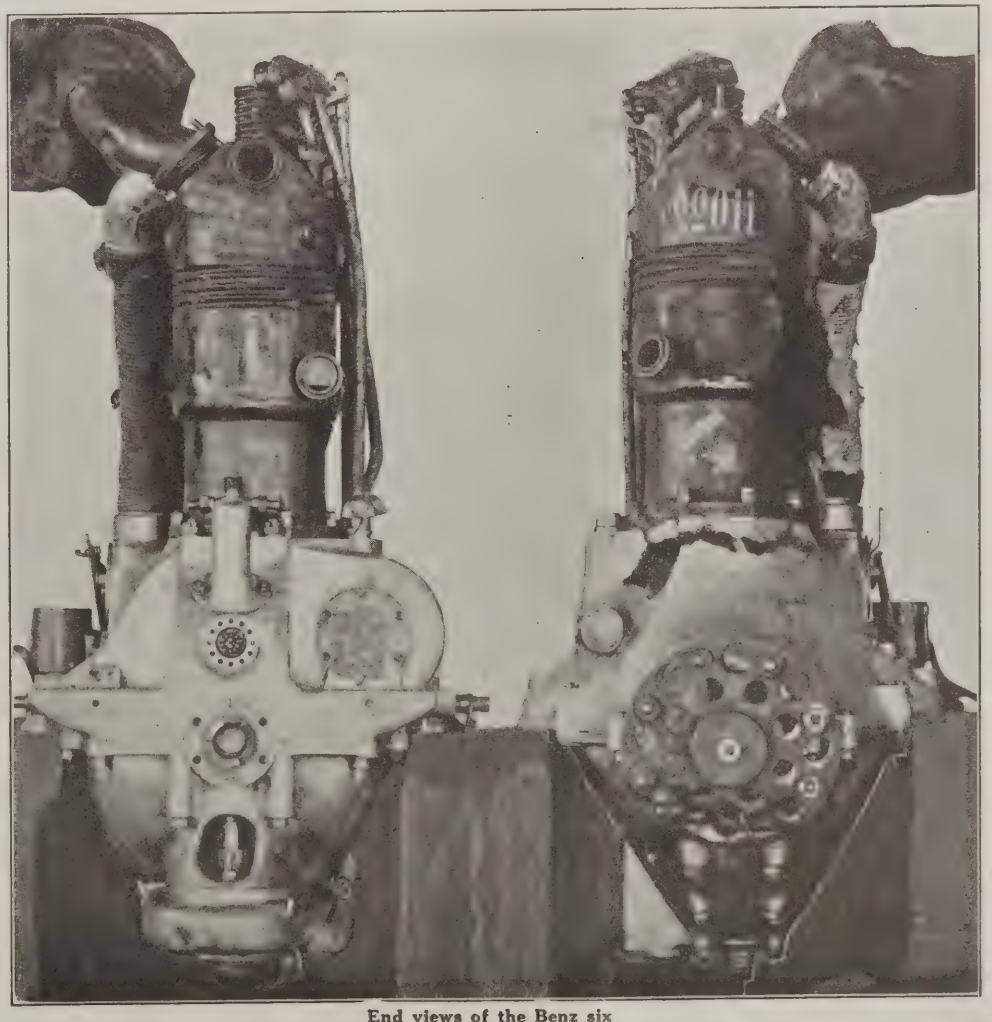
The rights to construct this engine in Great Britain and the Colonies were secured by William Beardmore & Son, of Glasgow, Scotland. The engine is also being built by T. C. Pullinger and Arrol Johnston of Dumfries, Scotland. This engine has an offset crankshaft. In my estimation the intake pipe and carbureter arrangement on this are the best of any of the aviation engines.

The lubrication also is different from any other aviation engine, since individual high pressure metering pumps are used to deliver fresh oil only to the bearings and cylinders, as was the custom in automobile practice some ten years ago.

Effect of Offset Cylinders

Two of the engines described, the Benz and Austro-Daimler, have the offset crankshaft construction. This has for a long time been common in German and Belgian construction. Offsetting the crank has two effects, one to decrease the guide pressure of the piston and cylinder, and the other (which is purely a secondary effect) to lengthen the stroke of the piston as the offset is increased with any given crankpin circle. I have drawn four figures to show the effect of offsetting. Normal construction is at (*a*), Fig. 2. There is no offset and the connecting-rod length is 2¼ times the stroke. To the left the cylinder is shown graphically the inertia and gas pressure diagrams. To the right of the cylinder is shown the guide pressure diagram for four phases of the cycle.

(*b*) shows similar diagrams for offset equal to ⅛ the



End views of the Benz six

stroke. The guide pressure is materially reduced on the expansion stroke.

(c) shows an abnormal amount of offset, being equal to half the stroke. The guide pressure becomes considerably greater than in normal engine and suffers severe variations during the four strokes of the cycle.

Sizes of Engines Required

It begins to be more and more apparent that engines of less than 200 hp. have only a limited field.

Even in the small high-speed scouting machines which fly at from 125 to 140 m.p.h. it has been found necessary to use

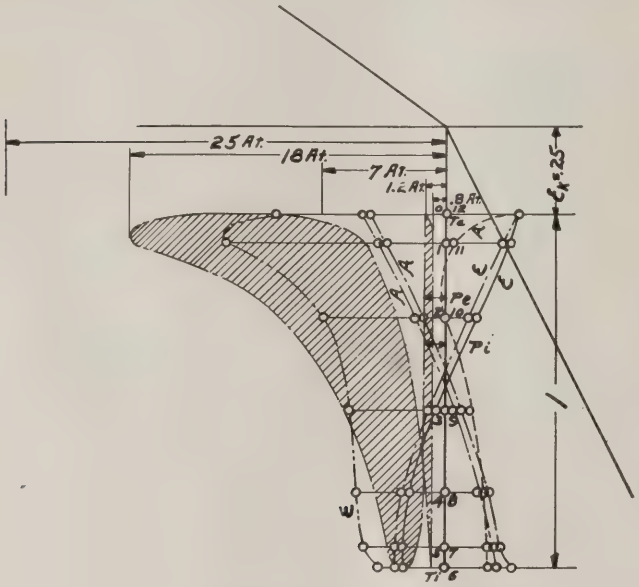


Fig. 1. Pressure diagram of offset crankshaft

upward of 300 hp. This does not mean that they actually have 300 hp. at the altitude at which they usually fly, but only a fraction of this. The major problem which is at present confronting aviation engine designers is to compensate for the decreased weight charge at the higher altitudes. The enormous drop in temperature experienced when rising to heights of from sixteen to twenty thousand feet also introduces serious carbureter difficulties. It is almost impossible to stimulate on a test block the conditions imposed on an aviation engine when in the air. In Fig. 3 is shown the variation of temperature with the altitude up to approximately seventeen thousand feet. The data for these curves were obtained by the British Royal Flying Corps. When an engine in the course of ten minutes' operation has to pass through the whole range of temperature experienced from summer to winter, difficulties of no mean order will be encountered.

The enormous loss in density of air occurs with the rising altitude, as is shown in Fig. 4, which is based on a standard density of air at 760 mm., pressure with temperature of 16 deg.

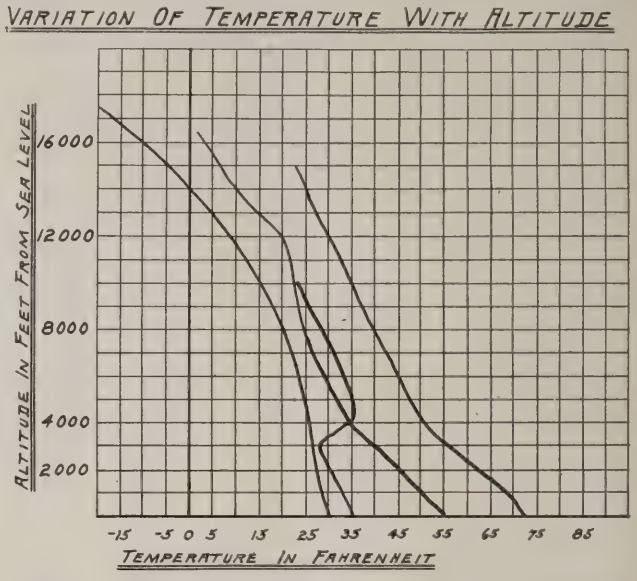


Fig. 3. Curves Showing Variation of Temperature with Altitude

cent. The weight of air at this standard reading is 1,221 per cu. m.

In Fig. 5 is shown the variation of speed of the plane and

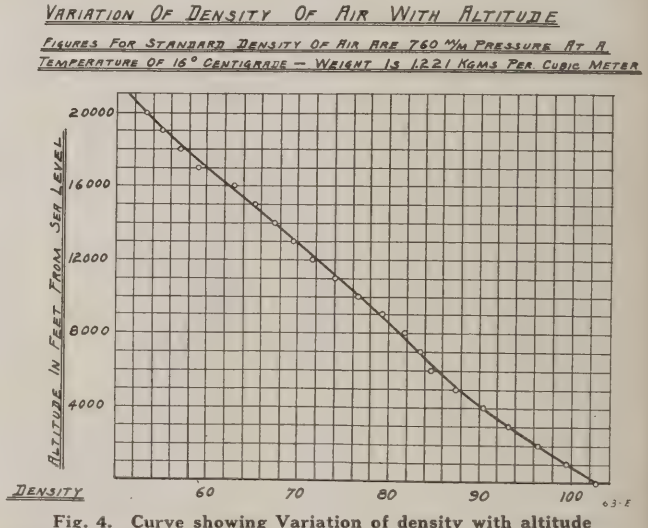
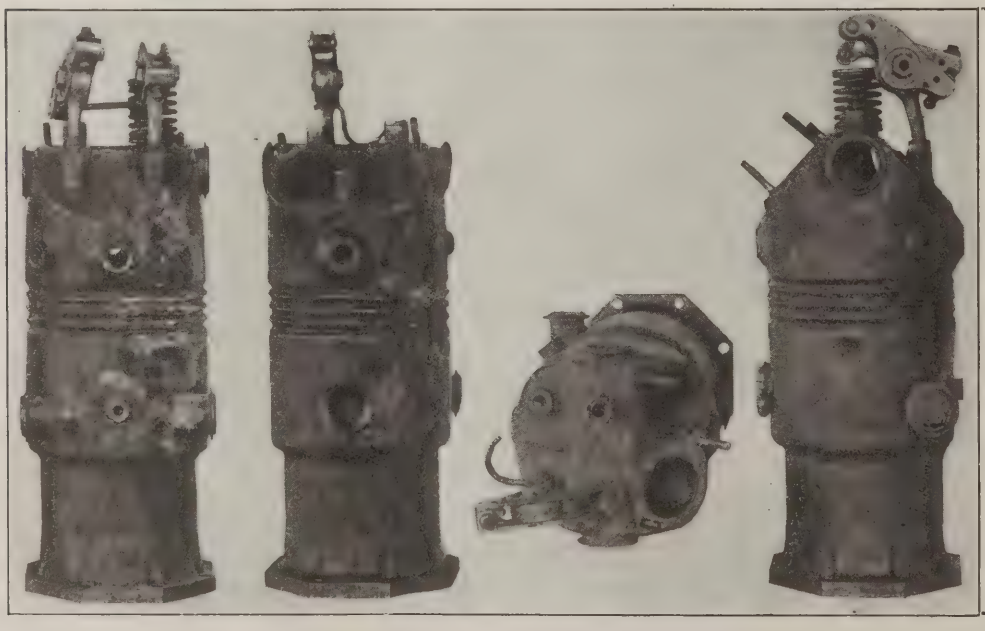


Fig. 4. Curve showing Variation of density with altitude



Benz cylinder construction

the engine with increasing altitude. The speed of the plane does not fall off quite so fast as the engine speed. This is due to the increasing propeller efficiency as the speed decreases from 1300 to 1150 r.p.m.

Fig. 6 shows compression variation with the altitude necessary to compensate for the decrease in density of the air. It will be observed that starting with the compression ratio of five to one at sea level, it becomes necessary to have a compression ratio of nine to one at eighteen thousand feet.

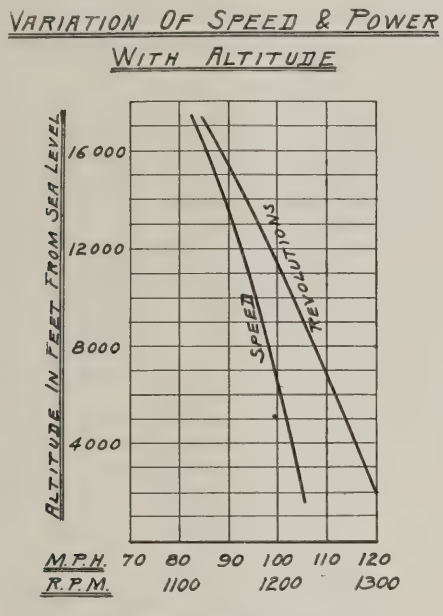


Fig. 5. Curves Showing Variation of Speed and Power with Altitude

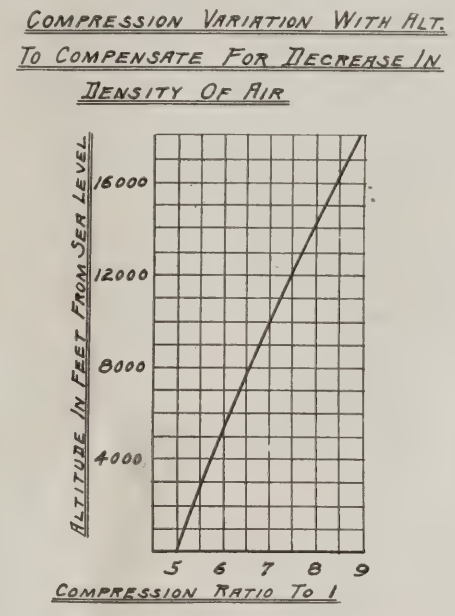


Fig. 6. Curve Showing Compression Ratio to Compensate for Decrease in Density of Air

What we need immediately in America is a large number of training planes, but we also will have to have battle planes driven by engines that are not equal to, but superior to those possesed by the enemy. The real danger is that the evolution of our engine will not be fast enough. We have not as yet enough clever minds engaged in these channels and we have not had stimulus for this sort of work. We have always had, continually in the past, that specter, cost, starting us in the face.

A lieutenant in the British Flying Corps has said that there was no question of price at all if an engine would deliver the goods. A great deal has been done toward securing high horsepower-weight efficiency by means of lightening the various parts of the engine, and I feel certain that in a great many particulars this line of thought has reached its limit.

The really important thing about aeronautic engines from now on is going to be the number of cubic feet of mixture per minute that they can handle. In connection with four-stroke cycle engines this points out the necessity of using relatively high speeds. The mean effective pressure arrived at in the Sunbeam engines is within 15 per cent of the theoretical maximum that is possible, and while there may be some improvement secured in the future in the matter of horsepower-weight efficiency by further refinement in the mechanical construction, I believe that is now necessary to make some change in the cycle of operation. This should be a splendid oportunity to try out super-compression and super-charging schemes of one sort or another. Possibly the two-stroke cycle engine, with its maze of new problems, stands as an opportunity.

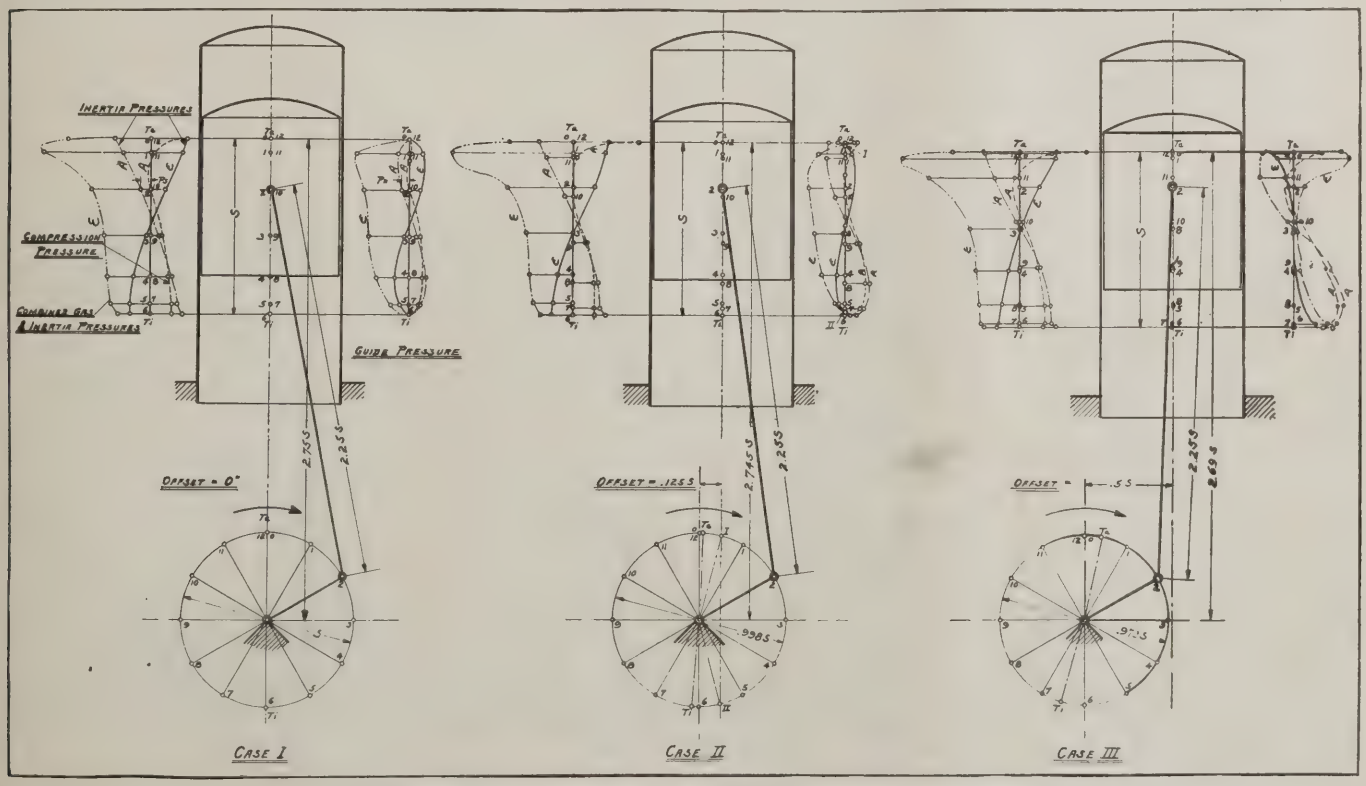


Fig. 2. Pressure diagrams showing the effect of offsetting the cylinder

AEROPLANE FABRICS AND VARNISHES

By OTTORINO POMILIO

IN the first years of aeroplane construction rubberized fabrics were used which were of the type employed for the envelope of dirigible balloons. But these fabrics were not very lasting because of the corrosive action of any oil or gasoline with which they came in contact and because of the oxydizing action of the air.



Finished planes being taken to the room where the Emaillite is applied

To-day, cotton fabrics are used exclusively. These are given a coat of some specially made varnish (emaillite, novaria, etc.) The use of the last mentioned has considerably increased in these last two years on account of the lack of linen cloth. Linen cloth treated in this manner, is waterproof; it is not affected by corrosive or oxydizing agents and is easily washed.

Analysis can be made in order to ascertain if mature textile fibre is used.

One of the precautions to have in the choice of linen cloth or of cotton cloth for aeroplanes is to act in such a way that the texture should not be too dense so that it can easily absorb the varnish.

Linen fabric has a high tensile strength and is of very light weight. These properties make linen fabrics much more preferable than cotton fabrics.

Moreover, if linen cloth is well treated, it will not show any incrustation, thus making it impossible for any chemical reaction to set in and destroy the fabric.

To produce good linen cloth, it must be manufactured with special care; the fabric must be lye-washed thoroughly, then washed clean and made free from sizing; also it must not have undergone whiting, as it always retains some traces of chlorine.

All aeroplane cloth before using is submitted to the dynometrical tests in order to establish the resistance per square meter.

It is necessary to defile conveniently the silk testers in order to obtain a collection of threads well paralleled on all the length of the silk-tester.

The following table gives the weight in ounces per sq. yd. and the tensile strength in lbs. per linear yard for several types of linen fabric.

Weight in oz. per sq. yd.....	4.2	4.6	4.3	4.8	4.9	4.2	3.3	3.1	2.7
Tensile Resistance, per lbs. per yd	2580	2600	2760	3240	2760	3510	2710	2120	1940

The tensile strength is determined by means of special dynamometers. The tests are made in both directions of web and woof. The pieces of cloth to be tested can be of various dimensions in accordance with dynamometer used.

Varnish increases the strength of the fabric considerably—as much as 40% or 50%.

It is prudent, in order to determine the grade of resistance and the quality of aeroplane cloth, to make tests also on the cloth after varnishing.

The aeroplane varnishes can be divided in—two distinct categories: stretching varnish and finishing varnish.

The stretching varnishes are used to increase the resistance of the texture—they are used, as the word itself explains, to stretch and to render it impermeable.

The finishing varnish, instead, when used briefly after the first coat of varnish, must be protected from the atmospheric agents.

The essential quality of the stretching varnish must not react chemically harmful to the linen and must be composed of an acetate cellulosa solution (70/80 gr. for every liter of varnish) in volatile solvents not chlorated.

Acetate of cellulosa used must also be soluble in acetone; it must not contain any traces of free acids and mixed ether of cellulosa, it must be especially without sulphacetate of cellulosa.

Emaillite, a special solution of cellulose products, is the varnish most commonly used. This material, penetrating in the interstices of the web, forms a coating which renders fabric itself very homogeneous. This has been proven by the fact that for "emaillitized" cloths the ratio between stress and strain or elongation is quite constant. In varnishing cloth several coats are applied, each one being thorougly dry before the next one is applied. Before applying the last coat the preceding one is polished with very fine emery cloth.

Essential qualities of the stretching varnishes as in regard to impermeability and inflammability must be:



Testing fabric for tensile strength

Impermeability—The impermeability may be tried by pouring linseed oil on the cloth covered by three stratums of varnish. The oil must not penetrate the texture. The penetration of the oil is evidenced by a transparent spot.

Inflammability—The essential quality of varnish is that it should add as little as possible to the inflammability of the cloth.

Preservation—The varnish must have that quality which when kept in storage will remain unaltered; it will be poured into vessels which will not react with the varnish.

(*Continue on page* 617)



Fabric being stretched and sewn to the planes by skilled workers

FOREIGN NEWS

AUSTRIA

The official announcement for December 9th stated that Austrian aviators yesterday fought numerous aerial battles and shot down six Italian airplanes.

BELGIUM

An official announcement issued December 5th states: "Yesterday there was slight artillery activity. Bomb fighting took place near Dixmude. Last night enemy aviators bombed Furnes and Adinkerke. Today the artillery activity was moderate. Our aeroplanes carried out numerous missions.'

BULGARIA

Bulgarian airmen have been particularly active on the Macedonian front. The French and British have brought down many Bulgarian machines.

CANADA

Cadet J. H. Bacon, of Grand Forks, N. D., who is training at Toronto for the Royal Flying Corps, while flying in the vicinity of the aerodrome, fell into a pocket and his plane crashed to the ground, killing two men who were riding a motorcycle.

FRANCE

A War office announcement of December 3rd includes the following paragraph:

"Enemy raids in the sector of Craonne and north of Sapigneul were without result. We penetrated a German trench east of Rheims and brought back prisoners. The artillery was engaged in rather spirited actions on the right bank of the Meuse.

"Enemy aviators last night bombarded the region north of Nancy. Three persons were wounded. On Monday two German aeroplanes were brought down by our pilots and six others were compelled to land within the enemy line."

The official communique for December 5th describes the following aerial activity:

"Enemy aviators last night bombarded the region north of Nancy. Three persons were wounded. On Monday two German aeroplanes were brought down by our pilots and six others were compelled to land within the enemy lines."

A supplementary night report states that:

Last night Dunkirk was bombed by enemy aeroplanes. Two civilians were killed.

The communique for December 6th includes the following paragraph:

Yesterday three German aeroplanes were brought down. Eight other machines, seriously damaged, fell inside their own lines. Our bombing aeroplanes have carried out various operations. Nine thousand kilos of projectiles were dropped, notably on the railway stations and storehouses at Lichtervelde and Cortemarck, on cantonments and bivouacs in the region of Laon and depots at Roussach.

German aeroplanes dropped bombs on the night of December 5-6 in the region of Dunkirk. Several casualties are reported. Calais also was bombarded last night. There were no casualties.

Two American aviators were wounded in action on December 5th, according to an official report. They are Corporal Walter A. Warren of Dublin, Ga., and Private Edward F. Ebsen of Buffalo, Mo.

The Navy Department announces the loss of C. A. Baker, as a result of a seaplane accident off the coast of France.

Two American aviators, while travelling behind the lines, were wounded by a bomb from a German raider. The same bomb killed two French women.

Charles Trincard of Brooklyn, New York, met his death in aerial combat as a member of the Lafayette Escadrille. Just after his death, official permission to return to his home, which he had been daily expecting, was received.

Lieutenant Lufbury, of Wallingford, Conn., of the Franco-American Flying Corps, brought down two more enemy planes. He is now officially credited with sixteen German machines, and a seventeenth is to be awarded, pending investigation.

Whiskey and Soda, the two mascots of the Lafayette Escadrille, have been removed to Paris. After receiving official citations for stalking a herd of cows just behind the French front, the mascots were deported to Paris.

Robert Rockwell, while on leave in Paris, visited his two friends, much to the surprise and alarm of the Parisiens. Both Whiskey and Soda eagerly jumped at Rockwell, but with no intention of harming him.

Whiskey and Soda are two Nubian lion cubs.

GERMANY

That American aerial preparation is viewed with some apprehension is reflected by an editorial which appeared in the Frankfuter Zeitung:

"It is undeniable that the Western powers are making tremendous efforts to prepare the new offensive next year by bombing attacks and to support it in a way quite unprecedented. There is no doubt that the Entente lay great stress on American assistance on this point. Nor do we doubt that the technical resources of the enemy will achieve brilliant work in this branch of equipment. But all this has its limits. The first and most effective restriction will be the German counter measures. Our General Staff, of course, have long known the views given above. That our industries will master the task thus laid upon them is beyond doubt to every German. We shall meet the enemy attack by German defence and counter attack. There will be a new increase in the fury of the war, both sides will multiply their strength, but it will be impossible for the enemy to gain the superiority. The development of the war in the air so far shows this. In this field also superiority in numbers is by no means decisive. Quality and the men are what decide."

GREAT BRITAIN

The British official announcement for December 7th contains the following paragraphs describing aerial activity:

"During Wednesday and Thursday bombing raids were carried out by our naval aircraft on the following objectives:

"Uytkerke airdrome, St. Denis-Westrem airdrome. Engel airdrome, Bruges docks and various railway traffic.

"Bombs were observed to explode, and fire was caused among huts and sheds. All our machines returned safely.

"In the course of the usual fighting of patrols two enemy aircraft were destroyed. Four more were shot down completely out of control, three of them being probably destroyed."

On December 9th several bombing expeditions were carried out successfully, as indicated in the following official report:

"On Saturday forenoon naval aircraft carried out a bombing raid upon the Aertryeke airdrome. The weather was cloudy, but many bombs were dropped upon the objectives. The bombers were attacked by enemy aircraft scouts, two of which were brought down completely out of control, and appeared to be damaged.

"During patrol flights two hostile machines were destroyed and one put out of control. All of our machines returned safely.

"On Thursday our aeroplanes continued their reconnoissance and photographic work over the enemy's position, lines of communication and airdromes. A particularly successful raid was carried out against the St. Valenciennes railway station and sidings, where fires were started.

"A great deal of fighting took place in which five hostile machines were brought down and three others driven down out of control. One of our machines is missing."

Seven persons were killed and twenty-one injured in a German aeroplane raid on London. Field Marshal Lord French Commander of the British home forces issued an official announcement, as follows:

"A raid by about twenty-five enemy airplanes took place early this morning. The first group of raiders came in over Kent at 1:30 A. M., and dropped bombs in various places on and near the coast. The second group made land shortly after 3 A. M., various machines proceeding up the Thames, and some distance into Kent. Both the above groups appear to have carried out preliminary attacks, with the object of drawing gunfire and exhausting the defences, for it was not until an hour later that the most serious attack developed.

"Between 4 and 5:30 A. M. two groups of enemy machines crossed the Essex coast, and three groups the Kent coast, proceeding towards London on converging courses. Their tactical plan seems to have been to deliver five simultaneous attacks on the capital from the northeast, east, and southwest. The whole of one group, however, was turned back by gunfire, and the others, not more than five or six machines, penetrated into London."

"One or two explosives and a large number of incendiary bombs were dropped in various districts about 5 A. M.

"Two raiders fell victims to our defences, in each case the entire crew of three men being captured alive.

"A number of fires occurred in London, but all were speedily got under control by the Metropolitan Fire Brigade.

"The casualties are believed light, but full police reports have not yet been received.

"A number of our own airplanes went up. They all landed safely."

According to newspaper reports, it appears that one Gotha did most of the damage inflicted by the raiders.

A new Zeppelin airship flew over London the day after German raid, but the noon-day crowds of the metropolis were relieved when they recognized its British markings. This is the first time that British Zeppelins have been reported.

ITALY

The entire official report for December 8th is devoted to aerial activity.

"On the Asiago Plateau yesterday the infantry action was limited to patrol encounters. Between the Asiago and the head of the Franzella Pass movements of enemy troops, which always kept out of our rifle range, were shelled for a long time by the concentrated fire of our batteries, and they also served as objectives for a big bombardment by our air squadrons and those of our allies. Altogether 150 machines dropped bombs on the enemy's lines, causing damage and losses and explosions in ammunition dumps. The valiant airmen, flying low, attacked enemy troops with machine guns.

"On the rest of the front there were artillery actions only, which were rather intense on the lower Piave. Last night our airships in the neighborhood of Quero and Motta di Livenza bombarded with several tons of bombs bivouacs and motor lorry columns in movement. Three enemy machines were brought down during the day."

On December 9th there was further activity in air, which receives the following mention in the official report:

"Our Caproni machines effectively bombarded the enemy's lines of communication on the Asiago Plateau, afterward firing with machine guns on troops leaving the bombed places.

"Last night our airships repeated their daring raids, dropping more than four tons of bombs on enemy encampments near Quero Motta di Livenza and Portogruaro. Two enemy aeroplanes were brought down, and a captive balloon which was on fire fell in the neighborhood of Grisolera."

A large number of British and French aviators are among the units which arrived at the Asiago sector of the Italian front to assist in halting the German advance. A large proportion of the British aviators are Canadian and American, who have been doing scout work in France.

An Associated Press dispatch describes a daring feat by an Italian airman, Lieutenant Ancillotto. Because of the large number of Austrian observation balloons on the Piave line, the Italian Government offered a bonus of 2,000 lire for every balloon brought down. Ancilotto had already destroyed two enemy observation balloons, and in his search for a third, spied a balloon observing Venice from the Piave line. He darted full speed toward his victim, ripping through the envelope and emerging from the other side with parts of the bag twisted around his propeller. The gas immediately caught fire from the aeroplane engine, burning observer, and scorching Lieutenant Ancillotto, but he was able to return safely to Maestre, a suburb of Venice, where his aerodrome is located.

RUSSIA

The Maximilist Government is using aeroplanes to circulate peace propaganda among German and Austrian troops. A manifesto containing a list of the social, economic and political aims of the Bolsheviki has been largely circulated; others assure the Germans that a peace with Russia will force the Allies to make a general peace.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

A Model for Winter Flying

Model flyers should not let the cold blasts of winter interfere to any great extent with their sport of model flying, for, in fact, winter offers many possibilities for the holding of unique and interesting contests. Of course, we cannot overlook the fact that there will be days of extreme cold weather and to fly models under such conditions would be foolhardy if not absurd, although the writer has known of and took part in events when the temperature was slightly above zero. It is quite impossible to achieve any results under such conditions for, in addition to the rubber freezing or the compressed air motor refusing to work, as the case may be, several bonfires are needed to afford some means of thawing out one's hands to prepare the model for further flight. When conditions are such perhaps it is most logical to stay indoors and design or build models to fly at such times as the weather will permit.

Although the winter season is not devoid of its extremely cold days, nevertheless, there are many days of sunshine and moderate weather when model flying can be done to the advantage of one's health and pleasure and it is for such occasions that the following model was designed. The model with wings of glossy red and equipped with skids rises from the surface of the ice and in banking in the sunshine with a background of snow-white hills is a picture worth seeing and the sight more than repays the builder for his work in preparing it. All models cannot be pictured against a background of snow, true enough, but the speed with which such a model should fly and its brilliantly colored wings reflecting in the sunlight does not need snow-covered hills to set off its beauty nor create interest; it is a specimen of beauty flying under any condition. Such a model can be made very easily; in fact, it can be drafted from another model by some few alterations. But perhaps it would be better to build an entirely new model and design it to suit the conditions under which it is planned to be flown.

Like most any other racing type model it is best to assemble the necessary materials, but first of all the tools, comprising a good sharp penknife, a small plane, a small pair of nippers, a small rat tail file, a 3-32nd hand bit and some sandpaper, coarse and fine. The materials for the model comprise two twenty-eight-inch, three-eighths by one-quarter inch strips of spruce for the main beams or fuselage. Two strips of spruce for the entering and trailing edges of the main wing and elevator, one strip for the entering edge twenty-nine inches long by one-quarter inch wide and one-eighth inch thick; the strip for the trailing edge should measure the same as the strip for the entering edge but to render it streamline should be planed down to three-thirty-seconds of an inch. Some quarter inch bamboo is necessary for the ribs and braces, but for the mounting of the propellers heavier bamboo is needed, that is, one-quarter inch by one-eighth and ten inches in length. For the chassis or skids nothing better than flat steel hat wire can be had, the required amount being six feet. About one yard of China silk thirty-six inches wide will do for the wings. Other things necessary consist of four small capper washers, two eight-inch propeller blanks, two six-inch pieces of round steel wire for shafts, six inches 3-32nd inch bronze tubing, a six-inch piece of flexible wire—clip wire will do—for mounting the rubber strands at the point of the model another six-inch piece of flexible wire to be made into S hooks, fifty feet of one-eighth inch flat rubber; a small bottle of glycerine for lubricating the rubber; six inches of rubber tubing to slip over the hooks to protect the rubber when winding; one winder to wind up the rubbers; a spool of white thread; a small bottle of glue, and last but not least, a small package of vermilion red powder which when mixed with shellac produces a remarkable coating for the wings, rendering a beautiful color of red which is beyond doubt one of the most interesting features of the model.

After all these things have been gathered together the first thing that should be done is to round off the edges of the main beams or fuselage members for streamline effect and shape both at one end so that when tied together bring the sticks to the form of the letter A. The six-inch strip of flexible wire should next be bent around the point of the frame and when securely fastened the ends of the wire should be looped to receive the hooks attached to the rubber strands. For the mounting of the propellers the two strips of ten-inch bamboo should be attached to the opposite ends of the frame members as follows: Niche both ends of the frame members so that when the pieces of bamboo are attached they will come flush with the top and bottom of the frame. One piece of bamboo is attached to the frame members on top and the other on the bottom. Allow about one inch and a quarter between the ends of the frame members and the ends of the bamboo trips.

(*To be continued*)



Some of the members of the Oakland Model Aero Club, Oakland, California, who participated in a contest recently held in that city. Those who witnessed the contest were greatly astonished at the results achieved by the members of this club; a few of the models made good altitude flights while others did well at distance. Membership to this club is limited to grammar and high school boys



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Guest of Honor

By G. R. S. of the R. F. C.

I landed with a fearful bump, and massacred a stately clump of bushes, on descending. And then the men of Bunkerville came rushing forward with a will, my bruised self befriending. They'd never seen, these ancient things, an aviator wearing Wings, and mighty was their Wonder. They cheered, they thumped me on the back, they spread my carcass in a sack, and tore my togs asunder.

They brought me, from the local inn, sufficient rustic ale and gin to fill the Bristol Channel. They asked me if I felt all right, they gave me diggings for the night, and wrapped me up in flannel.

They mustered then, two dozen strong, and bore my battered 'bus along towards the village smithy. "Old Jem'll patch 'un up," they said, "an' when you next flies over'ead our wishes will go with 'ee!"

The sermon on the Sabbath morn, descriptive of my plight forlorn and praising up our airmen, was one which took the church by storm; the rector's eulogy was warm: He called up good and rare men!

Ah! happy time, it haunts me still, that grand week-end at Bunkerville, more sweet than precious ointment. Oh! what would happen if they knew that, as a rule, I rarely flew, but held a staff appointment!

Speaking of Aeroplanes—

A friend once said, "this world is but a veil of tears, and we're the ships that sail thereon"; according to this belief it seems that an aviator is far better off than we humans who tread upon terra firma for his position brings him above the veil of tears. But after all, aviator like every human has his ups and downs which is quite consoling to ourselves. It seems to us however, that much of an aviator's troubles could be avoided if a little more judgment were exercised in the matter of providing for the unexpected. For instance, in the matter of motor trouble, very often brought about through faulty lubrication, improperly adjusted spark plugs, carbonized cylinders, etc., etc. To obviate the necessity of coming to earth in the case of trouble, it seems to us that an aviator might carry an extra motor, or in the least several additional cylinders so that in the event of trouble with the cylinder of a motor the faulty one might be replaced by a good one and so on. In the case of lubrication why trust to defective mechanism to lubricate when it would be just as easy to spray the entire motor with oil as a flower is sprayed with water, thereby insuring complete lubrication within and without. For the moment we cannot think of how easy it might be to adjust spark plugs while in flight but some day when we have more time we will devote a little space to this question and show up the inefficiency of some of these sox experts. There is no need for all this inefficiency and defectiveness in connection with motors, no siree; and when we get more time we're going to look into the matter and set this problem right once and for all.

A Tribute to Aeronitis

By M. G. G.

I've been thru all the sicknesses,
Among them 'pendicitis.
When I felt bad, and wanted to be glad,
I read the page AERONITIS.

Sickness was my hobby,
Best of all was tonsilitis.
But it's nothing, but the stuffing,
Of the real bird, AERONITIS.

Along around my 15th year,
I got acquainted with Bronchitis.
But for my sake, they didn't take,
From me, my AERONITIS.

When I feel angry at the world,
And get an attack of "Blueitis"
I buy a copy of AERIAL AGE
And turn to AERONITIS.

A Mere Detail

Knowledge of the rifle and all of its parts is an important part of the training given to U. S. Air Service. At first, this proves puzzling to the raw recruit. During the morning inspection, recently, one of the future airmen handled his rifle poorly, and was taken to task by the officer.

"Are you acquainted with the parts of your rifle?" he asked sternly.

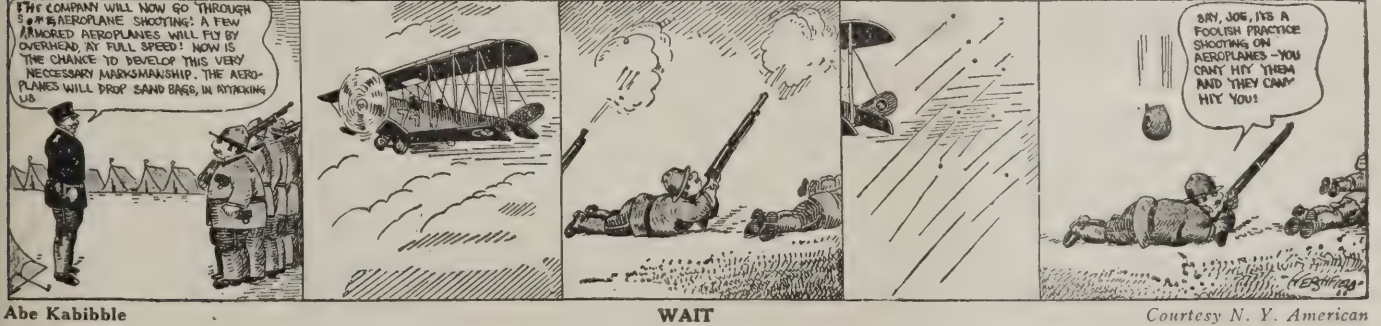
"Yes, sir," the recruit replied.

"Well, where is the balance located?"

"I don't know, sir," said the airman, glancing nervously at his rifle, "It was all here this morning."

A Verse

The flying fish was flying and as he flew and flew and flew
The wind about him blew and blew and blew
The bird above him soared and soared and soared
And the man in the boat below him snored and snored and snored.
The dog fish chased the cat fish round and round and round.
And the busted aviator slept calmly on the ground.



Abe Kabibble — **WAIT** — *Courtesy N. Y. American*



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Standard Type

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No. 1 Male, Short A-1522	No. 3 Male, Long A-1524

Curtiss Type

326 Short, Male	327 Long, Female
326 Short, Female	327 Short, Female
326 Long, Female	328 Long, Female
327 Long, Male	329 Long, Female

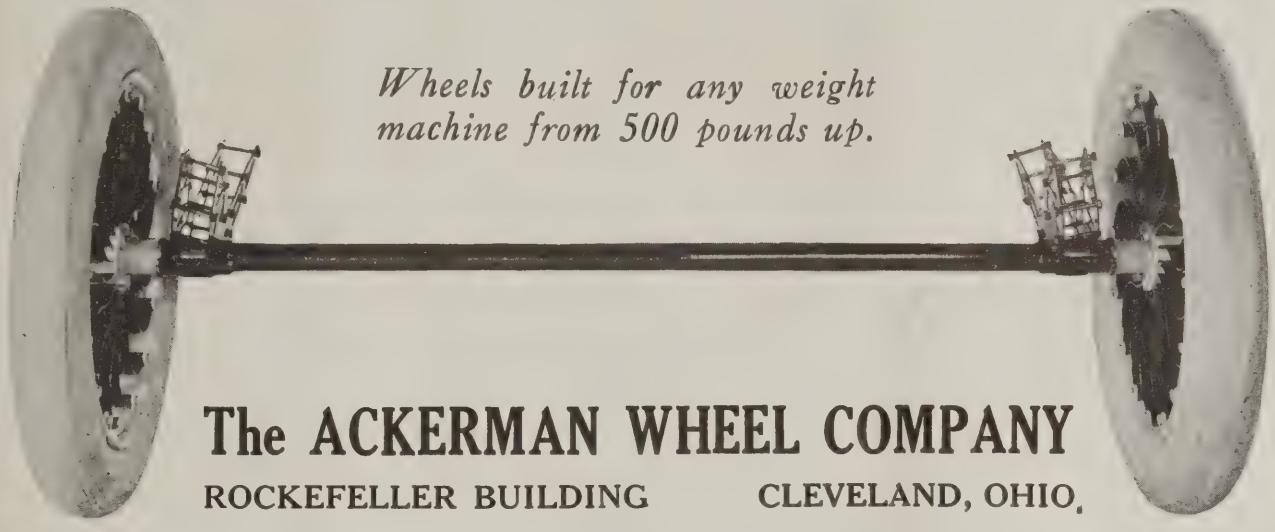


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However, the War Department has agreed, subject to Congressional approval, to turn over all planes no longer adaptable to military use, to the Post Office as a beginning of its air service. In view of the numbers which may be so transferred later, it is essential to lay plans without delay, as is being done by the Post Office Department, for the specific routes, the airdromes, quarters, personnel, etc. Abroad, both France and Italy have developed aerial mail service in a preliminary way to great advantage.

"The possible achievements of aeroplanes in speed and distance seem to be limited only by the imagination. Already an Italian plane in this country has carried 12 passengers to an altitude of 17,000 feet; another has flown without stop the 920 miles from Turin to Rome and back and the 656 miles from Turin, across the Alps, across France and the English Channel, to England. Just recently an English plane is reported to have arrived over Constantinople from London. Such instances of power and endurance indicate that commercial aviation is so close at hand that its problems must be foreseen.

"Among them are the 'rules of the air,' as compared with the 'rules of the road at sea'; the ownership of the air above private property; questions of police and registration; the right of landing, which was recently denied by an American town, the supply of airdromes at convenient intervals, the mapping out of air currents, etc. In the international field, questions will arise regarding the collection of customs on airplane freight which may be dropped anywhere within the country from skies; also questions of 'ports of entry'; and the reciprocal use of landing places and aerodromes.

"In addition, extensive plans are already under way for coast guarding by aeroplanes and mapping the whole United States from the air. Vessels in distress at sea can be located and derelicts destroyed more easily through the air than through a heavy sea. The ten coast guard air stations recently authorized by Congress will undoubtedly spring into being as soon as men and planes are available. Likewise, the enormous task of mapping the whole of the United States, now carried out at such expense and under such difficulties, may be much more easily accomplished through the aid of aerial photography. These are some of the problems requiring early consideration. It should be understood that this work has no direct relation with the present overwhelming war emergency, except as indirectly it may show the Air Service to be a permanent career for the man entering it and a permanent investment for the nation supporting it. The hope is expressed, however, that when peace comes there may be in hand a measurably complete and comprehensive plan for the immediate conversion with the minimum loss of time or money, of the human skill and material resources of the service. This should be regarded as, in effect, a measure of conservation, and the measures for which should receive the most careful consideration before the problems themselves are actually upon us."

Stability in General

(*Continued from page 607*)

upper wing is sometimes made to affect the alteration of the *C.A.*, whose new position, as shown in Fig. 6, is to the rearward and upward of the former attitude, caused by the preponderance of this surface back of and above the former *C.A.*

The *C.T.* is that point where the thrust of the propeller is centered and is acting along the axis of the propeller. The line of action of the *C.T.* is wholly moved to another point mainly by shifting the propeller axis. This is indicated in Fig. 7, where the new *C.T.* has been moved upward.

In dirigible design, in place of the *C.L.*, there is used instead the term Center of Buoyancy (*C.B.*), which is the center of gravity of the fluid displaced by the floating body. The *C.B.* can be shifted only by altering the shape of the envelope in which the gas is contained. The addition of a well-filled ballonet, clearly shown in Fig. 8, will cause the *C.B.* to move forward. This is due to the fact that air takes the place of gas displaced by the expanded balloonet, the result being that the gas is concentrated nearer the nose of the dirigible.

(*To be continued*)

Aeroplane Fabrics and Varnishes

(*Continued from page 612*)

Finishing Varnish

Finishing varnish is applied to the linen prepared with three or four coats of stretching varnish, which must not react harmfully to the stretching varnish; it must not contain resin (colophony); it must be transparent and have neutral action. Varnishes of linen oil only, as well as linen oil with hard or soft gums (copali damar, etc.) are allowed, all of which must be dissolved in the turpentine essence.

The linen, after the exsiccation of the varnish, must be preserved shiny, soft and smooth even when exposed to inclemency. The varnish must have the quality of extending itself easily in a subtle, uniform and interruptible stratum; to exsiccate within 24 hours and give, after the exsiccation a brilliant, resistant and durable surface to the wrinkling test; it must also support the washing in a solution of common soap from 5 to 10%.

Moler Aviation Instructors Move South

The Moler Aviation Instructors, Inc., with executive office and construction department in Chicago, Ill., have moved their flying equipment to Jacksonville Florida, for the winter, where they will train on the broad hard sand of Pablo Beach. The majority of their pupils are preparing and will offer themselves to the government service. The instruction work is in charge of Monte Rolfe, an English flyer of prominence, who is following the line of training of the Royal Flying Corps.

The veteran flyer, A. C. Beech, vice-president of the corporation, is devoting his time to the construction classes in Chicago.

Thomas

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AERIAL AGE WEEKLY

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PAN-AMERICAN AERO SHOW POSTPONED

THE Organization Committee of the Second Pan-American Aeronautic Exposition announces that in order to keep clear of any possibility of adding to the congestion on transporting facilities of the country, it has decided to postpone the exposition, which was to be held at the Grand Central Palace on February 16th to 23d.

As the entire purpose of holding the Show was to assist in carrying out the aerial program by the process of education outlined in the first announcement of the Exposition, the Committee feels that it can carry out such a program by holding a series of aeronautic conferences instead of holding the Show.

"AMERICA'S ROLE IN AERIAL WARFARE"

AN ARTICLE by Whitney Warren entitled "America's Rôle in Aerial Warfare" appears in this week's Revue Hebdomadaire. The writer begins by emphasizing the danger involved, not to say the harm already done, by the reproduction in the French press of extravagant assertions from America as to the strength of the aerial forces which the United States is assembling. He says:

"As for the 100,000 aeroplanes mentioned in sensational dispatches, I am not aware that a single one has yet crossed the sea. On the contrary, my information leads me to suppose that it is we who have ordered aeroplanes in the factories of the Allies to meet the needs of our army that is coming."

That, of course, does not mean that America's aerial contribution will be non-existent, or even negligible, Mr. Warren says, but it accentuates the need for speed and systematic work on the part of America. He then gives a résumé of the types of aeroplanes now used on the European front, which he divides into three categories, as follows:

1. Divisional aviation—Machines for scouting, photography, and artillery observation.
2. Aviation of Pursuit—Fast killer planes whose only mission is to attack the enemy fliers.
3. Bombplanes for work by day and night.

Three Avenues to Victory

It is clear that at the present juncture, Mr. Warren proceeds, either adversary who can win the mastery of the air will have the greatest chance of victory. There are three methods of defeating an enemy—by exhausting his military, economic, or moral strength. The mastery of the air would accomplish all three objects.

As regards military strength, Mr. Warren says, air mastery would put out an opponents' eyes and blind his infantry, artillery, and high command. Against economic forces an aggressive bombing policy would be extremely effective, at once destroying industrial resources which Germany cannot replace owing to the blockade and forcing a cessation of submarine warfare by its bloody reprisals. Similarly, as regards, morale, persistent air raids destroy an enemy's confidence, and the side that loses confidence has lost the war.

To win this mastery, Mr. Warren continues, unquestioned superiority is required not only in numbers, but in offensive and defensive armament and in climbing and horizontal speed. Statements from the American press reproduced in France give the impression that by next Summer allied aviation, thanks to American aid will have overwhelmed German aviation. The writer continues:

"The truth is that at that time, while America will not have been able to supply a single aeroplane, the German air fleet will be one-third superior to the French. That shows what we have got to do. The question is how are we to render our collaboration more active and efficacious?"

Army Leader Urges Haste

Mr. Warren then quotes verbatim a statement made to him in July by a great soldier for publication in the American press insisting on the urgent need for haste. From this statement it is obvious that to win the mastery of the air we must have a great superiority in the number and quality of machines over the enemy. France cannot increase and speed up her production, owing to the shortage of materials and of labor unless she decides to devote to aeroplane construction a large proportion of labor and material at present used for other war purposes. This she would be able to do, as many of her workers in other branches are specialists of high grade required for delicate aeroplane construction, but on the sole condition that she receives from America assurance that the latter will handle the production of automobiles, artillery and munitions necessary for the French army. That would enable France to concentrate on aviation.

At the same time the statement of the French General insists on standardization and rapidity of production of aeroplines and motors. To accomplish this successfully necessitates continuous night and day work, with three eight-hour shifts, instead of working eight hours a day only, as is the case at present in the French aeroplane factories owing to the labor shortage. It is therefore held to be desirable that America shall also send to France as many as possible of her high-grade specialists to assist in the work not only in the industrial centers, but also in aviation repair and machine shops in the army zone, whose task is of fully equal importance.

Italy's Need in the Adriatic

The general lines of the above program, Mr. Warren says, have been indicated from the best French sources. Information from Italy tends in precisely the similar direction. There, too, an enormous increase in aeroplanes is necessary in the proportion that if Italy had 120 squadrillas in 1915, she will now require 1,200, or about 10,000 aeroplanes to triumph over the Austrians.

The writer ends with the citation of a letter he received from Thaon de Revel insisting on the need of sea as well as land aeroplanes. A great fleet of seaplanes would give the Italian the complete mastery of the Adriatic, on which depends in no small degree the decision of the submarine problem owing to the allied inability to prevent U-boats from making their way from Adriatic ports across the Mediterranean through the Straits of Gibraltar into the Atlantic. America, Mr. Warren holds, thus has as great an interest

in the question of the Adriatic as of the French war front.

It is America's duty to realize now how urgent is the need for haste, Mr. Warren says, and to spare no effort in bringing about that allied air superiority which, if not absolutely vital, is at least one of the most important conditions of victory.

TEXT OF SUPPRESSED APPEAL

French General's Statement of How America Can Help in Aviation

The statement, "by a great soldier," published in Paris by Mr. Warren, was prepared for transmission to The New York *Times* by one of the most conspicuous of French Generals in the latter part of July last. It was at first suppressed by the American censorship at General Pershing's headquarters. Later, on representations made by The *Times* correspondent, General Pershing gave his consent to the transmission of the statement. It was again offered for cabling, but this time was suppressed by the intervention of the American ambassador in Paris, William G. Sharp. The *Times* is now able, nearly five months after the preparation of the statement, to present it in full. It reads:

"In order to have the upper hand in aviation the Allies must have a far greater number of aeroplanes than the enemy and better ones. The Germans will soon have in France 3,000 machines. The most perfect of these machines has a speed of 200 kilometers per hour.

"On our side progress has been enormous since the beginning of the war. We have fifteen to twenty times as many avions as at that epoch and the speed of our fastest exceeds 200 kilometers. The English have realized the same progress. This represents an immense industrial effort. It should be realized that the whole aerial fleet must be made over every three months, which means that, in order to maintain its total effective, we must manufacture anew each month one-third of that effective. Add to this the fact that it takes from six to nine months to realize any new type of machine.

"America will therefore need to make great haste if she wants rapidly to attain big results. She must not hesitate before any effort to act quickly and accomplish much. Equip yourselves as if the war were going to last ten years, but speed yourselves as if it were going to end in six months. Above everything use speed. Words are costly; action alone counts in war.

"Do not forget that every day of the war costs the world in the neighborhood of $100,000,000 and that the blood spilled is priceless. The great difficulty is to get started. To get started is, first and above all, to begin the fabrication of motors in wholesale. You must produce between 20,000 and 30,000. Such an increase in production is by the forces of circumstances no longer possible in France or England, where manufacture has been pushed to the limit. What we need can only be accomplished by the resources at your disposal. Naturally, you must profit by the discoveries we have made, and I know, as far as this is concerned, that American constructors are getting into close contact with ours.

"What is important is that without losing a day a large number of American factories are being organized in America and perhaps also over here. In order to go quickly content yourselves with only two or three types of motor, choosing those which have attained the highest standard of perfection. The Germans have but two types, the Benz and the Mercedes, and this contributes certainly to facilitate their production. There is no need to have any more—a few types, but in each type an enormous output and perfect quality.

"I insist on the word perfect because the aeroplane is a very delicate instrument and if the motor is not perfect the whole machine is not only useless but murderous. The aviator trusts his life to his machine. Above all, commence! The task to be accomplished is of a magnitude worthy of America, but there is not one day to be lost."

Captain Bartlett's Brother Loses Life

Captain Rupert Bartlett, the brother of Captain Robert A. Bartlett, the noted explorer, lost his life at the front on November 30th. In an editorial, entitled "A Gallant Life," the *Standard Union* says:

I do not think a braver gentleman,
More active-valiant, or more valiant-young
More daring, or more bold, is now alive,
To grace this latter age with noble deeds.

Americans and Canadians everywhere will join in a tribute of sympathy and admiration to Capt. Robert A. Bartlett, navigator of Peary's "Roosevelt" and the Canadian Arctic "Karluk," in the loss of his younger bother, Capt. Rupert Bartlett, of the Newfoundland oversea battalion, who fell in action on the western front November 30th. *Captain Bartlett, a young civil engineer, had a brilliant military record, and, had he lived, would doubtless have gone far in rank and distinction. Serving at Gallipoli, in Egypt, and long on the western front, he was promoted Captain on the field for gallantry in action, and, later, was awarded the double bar of distinguished merit. The long roll of bright and gallant lives like Bartlett's, sacrificed as the price of redemption from ambition and frightfulness which stops at nothing, grows steadily longer. Toll will ultimately be collected in full, but the price is heavy and the sacrifice tries the stoutest of hearts. America's Calvary is yet to come, and may she prove worthy and able to endure; otherwise, as Lincoln said at Gettysburg, all these will have died in vain.*

Bombing Planes Will Do It

"A hundred and fifty Italian flying machines, dropping dynamite, have done much to disorganize the German attack—and they dropped only 2,000 bombs in all.

"What would a hundred thousand American flyers do to the German people, each flier dropping 100 small bombs? And when will a hundred thousand start work above the dear Fatherland?

"A hundred thousand flying machines could drop ten million small dynamite bombs every twenty-four hours.

"And ten million dynamite explosions divided impartially every day among seventy millions of people in a territory no larger than Texas would make the Germans take an interest in peace."—*Washington "Times," Dec.* 10.

The Airman

Alone with God the Airman soars,
A speck upon the boundless sky—
He jove-like grasps a thunderbolt,
Below the pageant clouds roll by.
As dimly as a flitting dream,
He sees the speeding foe afar—
Down, down, the sickening depths of space,
Down, downward like a falling star.
A whirr, a rush, a flare of flame,
He hurls his bolt upon the Hun—
A spark fast fading earthward falls,
While he exultant seeks the sun.

J. E. Kelly.

To F. Trubee Davison—An American Hero

By George L. Upshur

A hero did not have to fall,
Upon some sodden battle-plane.
You listened to your country's call,
And then through constant toil and strain,
Gave all that there within you lay,
To do your home and country good,
Your last thought centered night and day,
In principles for which it stood.
Your sacrifice will surely show,
To thousands of your soldier friends,
The splendid way that they must go,
To carry out the highest ends.
A hundred men will take your place,
Inspired by example grand,
In this way you have done your race
More good than falling in a land,
Where other heroes fall each day,
Midst clash and smoke and battle roar,
Whose mem'ry soon must pass away,
Influence gone for evermore.
So Trubee, breathe a prayer of thanks,
You've given more than you can tell,
Each soldier from the "Staff" to "ranks,"
Will profit by the day you fell.
You've done your bit, and finely, too,
You've done the very best you can,
You've counted 'mongst the very few,
You'll bear your sufferings like a man.



THE NEWS OF THE WEEK



Craig Biddle Now Army Aviator

Craig Biddle, the crack tennis player, society and clubman enlisted in the Aviation Section of the United States Army, and is to report at Kelly Field, South San Antonio for Training.

Mr. Biddle took examinations for a commission last year but failed to pass, owing to deficiency in mathematics. His experience with motors and motor cars is expected to prove of value in dealing with aeroplane motors.

Aviator Lands in Poor Farm

In the midst of a heavy snowstorm which covered all landmarks, was a group of buildings which appeared to one of the military aviation students to be the headquarters of Camp Upton, the destination of his flight. But his reception was hardly a military one, for he found that he had landed in the Yaphank Poor Farm. When he learned his mistake, he resumed his journey.

Thirten aviators from Hazelhurst, the Government aviation field at Mineola, flew through the snowstorm to Camp Upton and back. They started about 11 A. M. and returned about 2 P. M., an average speed of 75 miles per hour.

A Correction

In December 10th issue of AERIAL AGE, page 559, was reproduced a photograph of a speed scout. This was constructed by the M. Berckmans Aeroplane Company, and not by the C-E Company, as stated in the caption.

Aeroplane Manufacturers Boost War Fund

The employees of the Dayton-Wright Aeroplane Company, the Delco, the Domestic Engineering Company and the Dayton Metal Products Company have contributed a total of $25,000 to the soldiers' welfare fund, which is being raised in Dayton, Ohio. The fund total is over $100,000.

Telephone Men Send Zeppelin Souvenirs

Members of the telephone detachment which was supplied by the Bell telephone system are sending to the officers of the company in New York, Chicago, Philadelphia and Pittsburgh letter racks, paper weights and other souvenirs made of pieces of the framework of the Zeppelin L-49, combined with the ends of the wire cut off when the telephone connection was installed in Pershing's private office at headquarters.

Aviation Student Weds

Harris Whittemore, Jr., of Naugatuck, Conn., married Miss Roberty Napier Forde of Montreal on December 15th, at the home of the bride's uncle.

Mr. Whittemore at the outbreak of the war was a senior in Yale University. He is now studying aviation under Government instructors at the Massachusetts Institute of Technology.

Lieutenant-Colonel Filley, of Aviation Section, Marries Miss Mary Pyne

Lieutenant-Colonel Oliver Dwight Filley, Aviation Section, Signal Corps, married Miss Mary Pyne at the Church of the Epiphany, New York City.



Mr. Harry B. Wise, who has been appointed Sales Manager of the Hartzell Walnut Sales Co.

The bridegroom is the son of the late Oliver D. Filley, Jr., and the grandson of the late Oliver D. Filley, who at one time was Mayor of St. Louis. He is a graduate of Rugby, in England, and later, of Harvard University. When the war broke out he was in Rhodesia, South Africa, from where he went to England, and became a member of the Royal Flying Corps. In 1915 he received the Military Cross for bravery. He was recently transferred to service here.

Y. M. C. A. Opens Air Mechanics' School

The West Side Y. M. C. A. has opened a school for the training of aeroplane mechanics at 240 West 53rd Street, New York. The school has an equipment consisting of a Curtiss engine and a Maximotor, both mounted on a Government type testing stand, so that they are accessibe for disassembling, reassembling and study. There is also a Thomas tractor biplane and a Standard Aero speed-scout biplane and a large assortment of parts and accessories for motors and planes.

The present enrollment is about 150 students, and, owing to the large number of applicants, the management is contemplating doubling the present space. Assurance has been given that all students who pass the physical tests will be enlisted in the aviation corps at once, or will have no difficulty in obtaining employment in aeroplane factories.

H. B. Wise in Charge Walnut Sales

The Hartzell Walnut Sales Co., a company incorporated under the laws of New York State, have opened large offices and display rooms in the Times Building, 1475 Broadway, where they will handle the product of the Hartzell Walnut Propeller Co., of Piqua, Ohio, the general management and sales being under the direct supervision of Mr. Harry B. Wise, who for many years has been identified with the aeroplane and propeller business in all of its branches.

Six years ago Mr. Wise made an extensive canvass of the United States, Mexico and Canada, following up directly the propeller business, and since that time has had ample opportunity to study the different phases of this subject, both here and abroad.

The Hartzell Walnut Propeller Co., of Piqua, Ohio, are the largest individual producers of black walnut propellers in this country. Their plant is most complete in every detail and they control the propeller material from the forest to the finished article.

The large saw mills and steam curing kilns of this company are said to be the finest in the country, and their system of steam and humidity kilns have a capacity of many hundreds of thousands of feet weekly. The curing, tempering, glue rooms and finishing rooms are controlled by hydrostatic indicating dials in the superintendent's offices in the main plant, so that all material going into the make-up of the Hartzell propeller is absolutely of the highest grade.

Mr. Wise has been most fortunate in securing for the Hartzell Walnut Sales Co., Inc., the services of the noted aeronautical and propeller engineer, Mr. Frederick Charavey, who is in direct supervision of the engineering force at the plant. Mr. Charavey's ability in propeller designing is too well known to need much elaboration. His time is now practically all taken up on working out propeller designs for the various machines being constructed in this country for our home government.

The Hartzell Walnut Propeller Co. have also just completed their steering wheel plant, where they manufacture American Walnut steering wheels in all sizes for aeroplanes and automobiles.

Wardrop Lectures Before Hartford University Club

Mr. G. Douglas Wardrop, Editor of Aerial Age Weekly, lectured before the University Club of Hartford on December 15th. He discussed the value and importance of aeronautics in the war.



© International Film Co.

A flying field "somewhere in the United States," where airmen are receiving their initial flying tuition. Photo passed by Censor

Burgess Leaves Marblehead

W. Starling Burgess, president of the Burgess Company, manufacturers of aeroplanes, seaplanes and their accessories, at Marblehead, Mass., has accepted a commission as lieutenant commander in the Bureau of Construction and Repair, Navy Department, and will be stationed at Washington in the aeronautical engineering division under Admiral Taylor and associated with Naval Constructor Hunsaker.

Mr. Burgess was graduated from Harvard in 1901. After completing the courses in special engineering and naval architecture, followed in the steps of his father as a naval architect. His success was so pronounced that within a very short time his offices were moved from Boston to Salem, where he started the first Burgess Yacht Yard.

This in turn proved too small; and with the growth of his work the No. 1 plant of the Burgess Company was purchased in Marblehead and for a number of years was devoted entirely to the construction of fast, sailing and motor craft of his design.

Mr. Burgess became interested in aeronautics at about the time that the Wright Brothers were achieving success in Ohio. He designed and constructed a number of experimental machines in conjunction with Mr. G. S. Curtis, Jr., of Boston, and flew them at Plum Island. They proved so successful that the U. S. Army placed contracts with the Burgess Company and Curtis for aeroplanes in 1911, these being among the first regular requisitions for aircraft in our military service.

From that time up to the present the business has steadily grown. In 1915 a combat machine of Mr. Burgess' design was produced at the request of the British Admiralty, and shipped to England in considerable quantity.

Early in this year the No. 2 plant was erected at Little Harbor, Marblehead, and is now, with the No. 1 plant, engaged solely in the manufacture of military aircraft.

Mr. Burgess' exceptional training, coupled with his long experience and his aptitude for original work, has been appreciated for some time in Washington among both Army and Naval officers. His final decision to accept a commission in the Navy, where he can devote himself exclusively to the problems connected with the development of naval aeronautics, is believed by his friends to be an especially fortunate arrangement. Divested of all problems of production, output and manufacturing details, and equipped with the resources of the designing departments of the Navy, his exceptional talent as a creator of new designs in marine aircraft should immediately prove of very great value to the government.

It is, of course, understood that Mr. Burgess' connection with the Navy will cease with the war, and it is hoped that he will resume his work in Marblehead with the Burgess Company.

With Mr. Burgess in the Burgess Company have been associated Mr. G. S. Curtis, Jr., of Boston, treasurer, and Mr. F. H. Russell of Marblehead, secretary and general manager. With the resignation of Mr. Burgess as president, the company will continue to be operated under the present management in affiliation with the Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y.

American Aviator in R. F. C. Awarded Military Cross and Distinguished Service Order

Lieutenant Clive Warman, of Chestnut Hill, Philadelphia, Penna., has been awarded by the authority of King George of England the Distinguished Service Order and the Military Cross "for conspicuous gallantry in destroying enemy machines on the Western Front."

Lieut. Warman enlisted as a private in the Canadian Expeditionary Forces in 1915 and as a member of the Royal Flying Corps has repeatedly distinguished himself. He was wounded in a combat with five Albatross Nieuports which took place at an altitude of 18,000 feet, and is now in a hospital in London recovering from his injuries.

Lieut. Warman has 15 enemy aeroplanes and 3 observation balloons to his credit, including 12 Albatross planes, 2 L. V. G. two-seaters and 1 D. F. W. Aviatik, as well as 3 balloons.

Yale Graduate in French Aviation Service

Russell E. Bracken-Corey, of New York, an active member in the French Aviation Corps, is only twenty-two years of age and has witnessed considerable action at the front. When the war broke out in 1914 Mr. Corey was about to graduate from Yale, but instead of remaining for the occasion he entered the ambulance corps of the Red Cross under Hodges Norton in which service he participated in many lively engagements along the French front. Not being entirely satisfied with this work he took up aviation at the L'Ecole Militaire where he received his license as a pilot. Later in view of his excellent service he was elected an Honorary Member of the Aero Club of France. Mr. Corey speaks French fluently, having received his earlier education at the Lycée Carnot in Paris.



The famous French aviator Gallois, who flew over and bombarded successfully the famous Krupp works at Essen.

Augustus Post Praises Lafayette Escadrille

In a speech before representatives of the Aero Club of America, the National Special Aid Society and the Automobile Club of America, Augustus Post, who has recently returned from France, paid tribute to the patriotism and service of the aviators of the Lafayette Escadrille.

Mr. Post pointed out that the Escadrille, before our entry into the war, represented America's pro-Ally sympathies and heartened the French during the long period during which our entry seemed inevitable but delayed, even though Germany was violating our rights and honor, because of our very lenient policy.

Lieut. Cobianchi Plans to Make Transatlantic Flight

Lieut. Cobianchi, an Italian aviator who states that he instructed Lieut. Resnati, arrived recently from Italy, with designs for a giant aeroplane in which he hopes to fly from Newfoundland to Portugal in sixteen hours.

The machine is to be a biplane with curved wings and will be propelled by three motors, developing 1,500 horsepower. There will be accommodation for seven passengers and Cobianchi expects that it will develop a speed of 200 miles an hour.

Lieutenant Cobianchi was one of the first aviators to fly across the Alps and distinguished himself several years ago by a flight from Trenzio to Valencia.

Miss Katherine Stinson Makes Non-Stop Record

Miss Katherine Stinson, the Texas aviatrix, established a new American non-stop record by flying from San Diego to San Francisco, a distance estimated unofficially at 610 miles, in 9 hours and 10 minutes.

Miss Stinson left the North Island Aviation grounds at 7:31 on December 11th and arrived at San Francisco at 4:41 P. M. In crossing the Tehachapi Mountains, she attained an altitude of 9,000 feet. The only discomfort encountered on the trip was due to the cold experienced while flying at high altitudes.

The official distance of the flight is to be stated after the Washington experts have sent the measurements to the Aero Club of America.

Ruth Law to Convince Congressmen

Miss Ruth Law is to give a series of exhibition flights in Washington for the enlightenment of members of Congress. She will execute a series of daring tricks in a Curtiss-Scout, which is on the way from Chicago.

Miss Law's application for admission in the Army Air Service was refused by the War Department on the plea that it is not permitted by law to accept women in any branch of the service. Hence Miss Law is making every effort to induce Congress to pass a special resolution in order to permit the War Department to give her a commission.

William Taylor, High Jump Champion, to Become Army Aviator

William H. Taylor, standing high jump champion of the United States, has made application for a commission in the Army Air Service. It was his intention to participate in the 1917 Olympic Games in Berlin, but since that has become impossible he aspires to be one of the first to "get there" in a bomb-dropping aeroplane.

Radio School for Army Fliers at Camp Vail

Several hangars and a radio instruction building are being erected at Camp Vail, Long Branch, N. J. The radio course will not be limited to ground work, but the aeroplanes will be equipped with wireless sets and instruction will be given during flight.

A. Leo Stevens Gives Thanksgiving Dinner to Balloon Students

A. Leo Stevens, the famous balloonist, Chief of the Aeronautic Department at Fort Omaha, gave a dinner to the students at the Omaha Aerodrome, which was a tremendous success. The table was decorated by a large airship model, and at each plate was a large rubber gas bag. All of the gas bags were released at the same time by the guests. Attached to each bag was a card bearing the guest's name and a request to "Notify the Balloon School the landing place of the balloon, and receive a prize." The greatest distance so far recorded was by the balloon released by Miss Edith Dunn, which landed at Rowley, Iowa, 100 miles distant.

Sergeant Hill of the R. F. C. gave a talk on aeronautics in the war and the guests were entertained by several solos and speeches.

The menu read as follows:

FEED TO THE "BALLOONITICS" OF THE AERODROME

November Twenty-ninth, Nineteen Seventeen

Kite Salad

Aerial Bird Anchor Killed Roast on Voyage

Dirigible Potatoes

Aerodrameted Giblet (Ballast Style)

Cloud Aerial Potatoes

Macaroni au Dumont (altitude style)

Roof Raised Radishes Parachute Celery

Pie a la Cloud Vaporized Ice Cream

Liquid Air

Rudder Cheese Pilot Crackers

Constellation Chocolate

Sky Lark Punch

Dream Sticks a la Pall Mall

Air Corps Aspirants not Affected by Draft

According to the N. Y. *Sun*, Capt. Morgan Grace, president of the aviation examining board for New York, states that no one desiring to enter the Aviation Corps should be deterred by the new regulation of the draft law which provides that no man who was registered under the provision of the national conscription law can voluntarily enlist in the service after noon on December 15.

Applications of men between the ages of 19 and 30 years who have been successful in passing the examinations and obtaining the recommendations of the examining boards will be received after December 15 just as they are being received at the present time. The Aviation Corps desires men who have good educations and are athletic. It is also desired that the applicants have some knowledge of the mechanism of gasoline engines.

Those desiring to enter the Aviation Corps should apply at 104 Broad street, this city. All applications will be considered as quickly as possible.

Goodyear Balloon School Well Organized

The Goodyear Rubber Company of Akron, Ohio, is producing large quantities of material for the Government in the field of aerostatics. A balloon school has been organized which provides very complete instruction for every branch of knowledge needed to make expert balloon pilots and observers for military purposes.

R. A. P. Preston is manager of the school and has charge of the flight instruction. Mr. C. H. Roth is chief instructor in the class room work, H. W. Ross instructor in theory and operation of gasoline motors, and Mr. Knowlin in wireless telegraphy.

The flying field is in charge of George Hockensmith, assisted by E. C. Russell. C. N. Hand takes care of the hydrogen and power plant, while W. H. Knocks is sergeant-at-arms, having charge of the guards, roads and grounds. J. J. Caughlin is parachute expert and directs the preparation of spherical and kite balloons for flight.

The equipment of the school is very complete and is turning out a large number of men for the Balloon Section of the Air Service.

NAVAL and MILITARY AERONAUTICS

Rules for Enlistment of Registrants in the Signal Corps, Aviation Section

The Provost Marshal General has sent the following telegram to the governors of all States:

"Section 151, Selective Service Regulations, is amended by the addition of the following paragraphs:

"E. Under such regulations as the Chief Signal Officer may prescribe, and upon receiving permission from the Chief Signal Officer to do so, candidates for commissions as flyers and observers and balloonists, Aviation Section, in the Signal Corps, may be enlisted in the Aviation Section, Signal Enlisted Reserve Corps, by duly constituted aviation examining boards. Thereafter upon presentation by the registrant to his local board of a certificate signed by the president or recorder of said examining board that he has been so enlisted, such certificates shall be filed with his questionnaire and the registrant shall be placed in class 5 on the ground that he is in the military service of the United States.

"F. Whenever a registrant who has been enlisted in the Navy, Marine Corps, Enlisted Reserve Corps of the Medical Department, Engineer Enlisted Reserve Corps, or Signal Enlisted Reserve Corps, under the provisions of paragraphs b, d, or e, as the case may be, this section, or who has been commissioned or appointed under provisions of paragraoh c, this section, shall be subsequently discharged from the military or naval service of the United States, it shall be the duty of the officer discharging him immediately to notify the registrant's local board of such discharge; said local board shall at once reclassify said registrant and if his class and order number has been reached he shall be physically examined, and if found physically qualified he shall forthwith be inducted into the military service and sent to the mobilization camp to which his board contributes.

"(Signed) CROWDER."

Special Orders 276

First Lieut. Maurice Clark, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for assignment to duty.

Second Lieut. Ferdinand Zegbaum, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for assignment to duty.

First Lieut. Walter G. Thomas, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation conceneration camp, for assignment to duty.

First Lieut. Robert Swartwout, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation conceneration camp, for assignment to duty.

First Lieut. James E. Towland, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation conceneration camp, for assignment to duty.

Second Lieut. William C. McGuire, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation conceneration camp, for assignment to duty.

First Lieut. Samuel H. Paul, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Gerstner Field, Lake Charles, La., for assignment to duty.

Capt. Robert F. Souther, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will report in person to the officer in charge, physical examining unit, Aviation Section, Signal Corps, Boston, Mass., for duty as medical member of Examining Board No. 2 and recruiting officer, and by letter to the Chief Signal Officer of the United States Army, Washington, D. C.

Second Lieut. William A. Marsh, Signal Corps, will proceed to South San Antonio, Texas, and upon arrivel report to the commanding officer, Kelly Field, for duty.



Major S. M. Decker, in charge of aerial photography in the Aviation Section, Signal Corps.

Chanute Field News

Judge Keneshaw Mountain Landis, the famous jurist, took the air for the first time at the Chanute aviation field several days ago, going up with Lieut. Harold Schroeder. The pair ascended to an altitude of more than eleven thousand feet and the judge did not turn a hair. When he returned to the ground he declared that he had enjoyed every minute of his trip and that he wanted to do it some more. He gave a lecture in the army Y. M. C. A. building that evening and at the conclusion of his talk he declared that he wanted to assist all of the American birdmen and that after they had gotten across he wanted any or all of them to write him if they had any matters back home which they wished given attention. He has a son in the service, Lieut. Reed Landis, who is now "somewhere in France."

Lieut. John M. Foote, who flew from Chanute Field to San Antonio several weeks ago, has returned to Rantoul and reported for duty. He states that the actual flying time on the trip was ten hours and twenty minutes, all through a bad fog. One snowstorm was so fierce, he reports, that the propeller blades were dulled.

Special Orders 282

The appointment of First Lieut. Richard Kreis, S. R. C., as captain in the National Guard of the United States, dating from December 3rd is announced.

A board of officers consisting of Col. Brice P. Disque, S. C., Major C. P. Stearns, S. C., and Major Richard Blackmore, Med. Res. Corps, is appointed to meet at Portland, Oregon, to examine applications for commissions in the Signal Corps.

Aviation Section, Sig. Off. Res. Corps, assigned to active duty, reporting to Chief Signal Officer, First Lieut. William T. Eustis, First Lieut. Walter S. Marvin, Second Lieut. Lamont A. Cadmus and Second Lieut. George H. McClellan.

First Lieut. Frank C. Hemmick, Av. Sec., S. R. C., to Langley Field, Hampton, Va., for duty.

A board of officers to consist of Major Norman J. Boots, Jun. Mil. Av., Sig. Corps, Maj. Leo G. Heffernan, Jun. Mil. Av., Sig. Corps and Capt. Courtney P. Grover, Med. Res. Corps, is appointed to meet at Fairfield, Ohio, to examine such officers as appear to determine their fitness for rating as Jun. Mil. Aviators.

Special Orders 281-282

First Lieut. Henry B. Herts, Av. Sec., S. R. C. to active duty at Garden City, L. I., N. Y.

First Lieuts. Jack Brackett, Powhatan H. Clarke, Roy Robinson, Lawrence Kinnaird and Frederick H. Morlan, Av. Sec., S. R. C., to active duty at Garden City, L. I., N. Y.

Second Lieut. John P. Giblin, Sig. Corps, to active duty at South San Antonio, Texas.

First Lieut. Robert R. Hampton, Med. Res. Corps., to active duty with Av. Sec. Sig. Corps, at Salt Lake City, Utah, on examining board.

Second Lieuts. Luther G. Franklin and Edward L. Gilbert, Av. Sec., S. C. to active duty at Morrison, Va.

First Lieuts. Arthur Thomas Roderick H. Tate, Jr., Roland T. Ingalls and Carl J. Schiller, Av. Sec. S. R. C., to active duty at Army Balloon School, at Fort Omaha, Neb.



The man back to, at the front end of each table, is sending radio messages which are being taken down by each one of the other men at the table. This is one of the first and most vital steps in the training of our new airmen. They are first given the broad principles of radio work, then actual practice in sending and receiving, and finally, use of the radio in reporting flashes on a miniature map exactly simulating an airman's view of the front trenches. Photo passed by Censor.



America's future airmen are here shown practicing the Morse International Code as one of the first steps in mastering the science of radio transmission which they will soon be using over the German trenches in France. Photo passed by Censor.

First Lieut. William H. Halley, Av. Sec. S. R. C., to active duty at Morrison, Va.

First Lieut. Vincent G. Geoghan, S. R. C., to active duty to Camp Travis, Fort Sam Houston, Texas.

Second Lieut. Robert W. Briggs, Av. Sec., S. R. C., to active duty at Morrison, Va.

Second Lieut. Wayland Weells Williams, Av. Sec., S. R. C., to active duty to Chief Signal Officer of the Army for assignment.

First Lieut. Lionel E. Drew, Av. Sec., S. R. C., to Chief Signal Officer for assignment.

Col. James B. Allison, Sig Corps, to Camp Alfred Vail, Little Silver, N. J.

First Lieut. Paul B. Clayton, Med. Res. Corps, to duty Little Rock, Ark., as member of Av. Sec. Signal Corps, examining board.

First Lieut. Rex P. Arthur, Av. Sec., S. R. C., to duty at Post Field, Fort Sill, Okla.

Second Lieut. Josiah Wheelwright, Av. Sec., S. R. C., to duty at Mt. Clemens, Mich.

The following-named officers, Aviation Section, Signal Reserve Corps, are ordered to active duty and will report to the commanding officer, Taliaferro Field, Hicks, Tex., for assignment to duty: First Lieut. Orville A. Ralston, First Lieut. Ralph D. Gracie, First Lieut. Harold Goodman Shoemaker, First Lieut. Oliver P. Johnson, First Lieut. Jesse Orin Creech.

The following-named officers are attached to the Aviation Section of the Signal Corps, effective August 5, 1917: Capt. Junius B. Alexander, Washington National Guard; Capt. Almon Strope, Arkansas National Guard; Capt Frank W. Wright, Oregon Coast Artillery; First Lieut. Emert Shields, Infantry, Indiana National Guard; First Lieut. Ernest Clark, Infantry, Indiana National Guard; First Lieut. George C. Furrow, Tennessee National Guard; First Lieut. Arthur A. R. Schleen, Infantry, Kansas National Guard; First Lieut. Keeling G. Pulliam, Kentucky National Guard; Second Lieut. Frederick I. Eglin, Indiana National Guard; Capt. Reuben H. Fleet, junior military aviator, Signal Corps, is attached to the Aviation Section, Signal Corps, from August 5, 1917, to November 5, 1917.

The following-named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Camp Greenleaf, Fort Oglethorpe, Ga., and are assigned to the Aviation Section, Signal Corps, and will proceed to the camps specified and report in person to the commanding generals of the divisions indicated for duty as junior members of physical examining units, medical members of examining boards, and recruiting officers, and by letter to the Chief Signal Officer, United States Army, Washington. D. C.: First Lieut. Bernard Barrow, Camp Jackson, Columbia, S. C.; 81st Division; First Lieut. Frank L. Field, Camp Lee, Petersburg, Va., 80th Division; First Lieut. Timothy T. Gibson, Camp Lewis, American Lake, Wash., 91st Division; First Lieut. Lee A. Hadley, Camp Meade, Annapolis Junction, Md., 79th Division; First Lieut. Brose S. Horne, Camp Sherman, Chillicothe, Ohio, 83d Division; First Lieut. Clarence H. Ketterer, Camp Taylor, Louisville, Ky., 84th Division; First Lieut. Walter C. Liebmann, Camp Upton, Long Island, N. Y., 77th Division; First Lieut. Arthur F. McDonald, Camp Travis, Fort Sam Houston, Tex., 90th Division; First Lieut. James H. Phillips, Camp Beauregard, Alexandria, La., 39th Division; First Lieut. Harper L. Proctor, Camp Bowie, Fort Worth, Tex., 36th Division; First Lieut. Samuel Roth, Camp Cody, Deming, N. Mex., 34th Division; First Lieut. David R. Scott, Camp Doniphan, Fort Sill, Okla., 35th Division; First Lieut. Curtis R. Senter, Camp Greene, Charlotte, N. C., 26th Division; First Lieut. Guy E. Stewart, Camp Kearny, Linda Vista, Cal., 40th Division; First Lieut. Maurice Williamson, Camp Shelby, Hattiesburg, Miss., 38th Division; First Lieut. Brickhouse Wilson, Camp Sheridan, Montgomery, Ala., 37th Division.

The travel directed is necessary in the military service.

The following-named officers of the Medical Reserve Corps are relieved from duty at the medical officers' training camp, Fort Benjamin Harrison, Ind., and assigned to the Aviation Section, Signal Corps, and will proceed to the camps specified and report in person to the commanding generals of the divisions indicated for duty as junior members of physical examining units, medical members of examining boards, and recruiting officers, and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: Capt. Nathan S. Davis, 3d, Camp Wadsworth, Spartanburg, S. C., 27th Division; Capt. William J. Uppendahl, Camp Custer, Battle Creek, Mich., 85th Division; Capt. George W. Beebe, Camp Logan, Houston, Tex., 33rd Division; First Lieut. Richard J. R. Gaines, Camp Devens, Ayer, Mass., 76th Division; First Lieut. Arthur W. Carley, Camp Sevier, Greenville, S. C., 30th Division; First Lieut. Adlai E. Callahan, Camp McClellan, Anniston, Ala., 29th Division; First Lieut. James B. Carroll, Camp Wheeler, Macon, Ga., 31st Fivision; First Lieut. Leonard Champion, Camp MacArthur, Waco, Tex.; 32d Division; First Lieut. Alexander A. Drill, Camp Hancock, Augusta, Ga., 28th Division; First Lieut. Samuel J. Ellison, Camp Dix, Wrightstown, N. J., 78th Division; First Lieut. Ralph W. Faus, Camp Dodge, Des Moines, Iowa, 88th Division; First Lieut. Edward J. Howland, Camp Funston, Fort Riley, Kans., 89th Division; First Lieut. Otto J. Schott, Camp Gordon, Atlanta, Ga., 82d Division; First Lieut. Edwin G. Schwarz, Camp Grant, Rockford, Ill., 86th Division.

The travel directed is necessary in the military service.

Second Lieut. Lambert A. Fagan, Aviation Section, Signal Reserve Corps, is ordered to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Herbert F. Duggan, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aeronautical concentration camp, for assignment to duty with a squadron. The travel directed is necessary in the military service.

The following-named officers of the Aviation Section, Signal Reserve Corps, are ordered to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty with a squadron: First Lieut. Harmon C. Rorison, First Lieut. Harold F. Marshall, First Lieut. Ralph S. Twitchell.

First Lieut. Maurice G. Cleary, Aviation Section, Signal Reserve Corps, is ordered to active duty and will report in person to the commanding officer, Post Field, Fort Sill, Okla., for assignment to duty.

First Lieut. William A. Williams, Aviation Section, Signal Reserve Corps, is ordered to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty with a squadron.

Special Orders 282, 283, 284

First Lieuts. Robert P. Jones and Roy C. Carter, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty.

First Lieut. Edward Rogal, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for assignment to duty.

First Lieut. Herbert A. Thorndike, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Fort Sill, Okla., and report in person to the commanding officer, School for Aerial Observers, for assignment to duty. The travel directed is necessary in the military service.

Lieut. Col. Byron O. Jones, Signal Corps, is detailed as a member of the Joint Army



An airman's first step in learning the science of radio, which he will shortly be called upon to use over the German trenches in France, is to master the International Morse Code. The men here shown are cadets at one of the "Ground Schools" practicing the sending of dots and dashes, which are immediately reproduced on the tape before them. This permits them to lengthen or shorten their motions until they are wholly accurate. Photo passed by Censor.

and Navy Technical Aircraft Board, vice Capt. Virginius E. Clark, Signal Corps, hereby relieved.

Second Lieut. Wallace A. Anderson, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Mount Clemens, Mich., and report to the commanding officer, Selfridge Field, for assignment to duty. The travel directed is necessary in the military service.

First Lieut. Charles E. Wolfe, Signal Reserve Corps, is assigned to active duty and will proceed from Washington, D. C., to Montgomery, Ala., in time to report on December 10, 1917, to the commanding officer, Signal Corps recruit depot, Camp Sheridan, for duty. The travel directed is necessary in the military service.

Maj. Paul L. Ferron, Aviation Section, Signal Corps, will proceed from Washington, D. C., to South San Antonio, Tex., and report in person to the commanding officer, Kelly Field, for assignment to duty. The travel directed is necessary in the military service.

First Lieut. Edward H. Cumpston, Jr., Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Robert C. Disque, Aviation Section, Signal Corps, will proceed to Portland, Ore., and report in person to Col Brice P. Disque, Yeon Building, for duty. The travel directed is necessary in the military service.

A board of officers to consists of: Maj. Edwin B. Lyon, Signal Corps; Capt Reuben H. Fleet, Signal Corps; and Capt. W. R. Ream. Medical Reserve Corps is appointed to meet at Rockwell Field, San Diego, Cal., at the call of the senior member of the board for the purpose of examining such officers as may appear before it to determine their fitness for rating as military aviators or junior military aviators.

A board of officers to consist of: Capt. Walter C. Fisher, Aviation Section, Signal Reserve Corps; and Capt. Louis Levy, Medical Reserve Corps, is appointed to meet at Salt Lake City, Utah, for the purpose of examining applicants for commissions in the Aviation Section, Signal Reserve Corps.

First Lieut. Clarence E. Hall, Aviation Section, Signal Reserve Corps, is relieved from his present duties and will proceed to this city and report in person to the Chief Signal Officer of the Army for temporary duty, and upon the completion thereof will proceed to Indianapolis, Ind., take station and report by telegraph to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Special Orders 284-5-6.

First Lieut. Charles E. Merrill, Inf. Res. Corps, to First Lieut (temporary) Sig. Corps, Reg. Army, to date from August 15-17.

First Lieut. Lawrence J. Willinger, Av. Sec., S. R. C., announced as on duty in aerial flights from Oct. 26, '17.

A board to consist of Lieut. Col. C. G. Hall, Sig. Corps.; Maj. Roy C. Kirtland, Sig. Corps., and Capt. Edward B. Beverly, Med. Res. Corps, meet at Washington, D. C., Dec. 6, to examine civilians for commissions in Motor Mechanics regiments authorized under acts of Congress approved May 18 and July 24, 1917.

The following-named officers, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, aeronautical general supply depot, Garden City, Long Island, N. Y., for duty: First Lieut. G. Givens Dixon, First Lieut. Virgil Hine, First Lieut. L. G. Irving, First Lieut. Arthur J. Perrault.



Lieut. Russell Bracken-Corey, a graduate of Yale University and member of the French Aviation Corps, doing good work in France

First Lieut. Richard Phelan, Aviation Section, Signal Reserve Corps, is assigned to active service, and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty.

Capt. Arthur W. Green, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Augusta, Ga., and report in person to the commanding general, Camp Hancock, for duty in the administration of the Signal Corps camp for motor mechanics. The travel directed is necessary in the military service.

Second Lieut. Irwin D. Wolf, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed without delay to Portland, Ore., and report in person to Col. Brice P. Disque, Yeon Building, for duty. The travel directed is necessary in the military

Second Lieut. Louis Blaney, Signal Reserve Corps, is assigned to active duty and will proceed to Portland, Ore., and report upon arrival service.

to Col. Brice P. Disque, Yeon Building, for duty. The travel directed is necessary in the military service.

Second Lieut. William E. Kapp, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.

First Lieut. Roland G. Blake, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, School of Military Aeronautics, Atlanta, Ga., for duty.

Second Lieut. Samuel H. Rantz, Signal Corps, will proceed to South San Antonio, Tex., and report upon arrival to the commanding officer, Kelly Field, for duty. The travel directed is necessary in the military service.

Second Lieut. John K. Shawvon, Signal Reserve Corps, is relieved from duty at Camp Alfred Vail, Little Silver, N. J., and will proceed to Chicago, Ill., and report upon arrival to the commanding general, Central Department, for assignment to duty as pigeon assistant to the department signal officer, Central Department. The travel directed is necessary in the military service.

First Lieut. Neil J. Cronin, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Iong Island, N. Y., for assignment to duty with a squadron.

Lieut. Col. Walter L. Clarke, Signal Corps, is relieved from his present duties and will proceed without delay to Camp McClellan, Anniston, Ala., and report in person to the commanding general, 6th Division (Regular), for duty as signal officer of that division. The travel directed is necessary in the military service.

First Lieut. Emmett S. McCormick, Signal Corps, is assigned to active duty and will proceed to Jersey City, N. J., and report to the commanding officer, 4th Regiment Armory, for duty with 413th Field Battalion. The travel directed is necessary in the military service.

Second Lieut. Ralph E. Bitner, Signal Reserve Corps, is assigned to active duty and will proceed from Ithaca, N. Y., to Washington, D. C., and report in person to the Chief Signal Officer of the Army for assignment to duty. The travel directed is necessary in the military service.

The following-named officers, Aviation Section, Signal Reserve Corps, are on duty requiring them to participate regularly and frequently in aerial flights from November 23, 1917: First Lieut. Robert B. Dawkins, Jr.; First Lieut. Charles S. Keyes.

First Lieut. Charles Burr Maxwell, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aeronautical concentration camp, for assignment to duty with a squadron. The travel directed is necessary in the military service.

First Lieuts. Walter J. Bradshaw and Frank P. Gillick, Signal Corps, will proceed to Fort Sill, Okla., and report in person to the commanding officer, School for Aerial Observers, for assignment to duty. The travel directed is necessary in the military service.

Maj. Arthur J. Hanlon, Signal Corps, will proceed to Scott Field, Belleville, Ill., for duty as executive officer. The travel directed is necessary in the military service.

Maj. Bruce B. Buttler, Signal Corps, will proceed to Rockwell Field, San Diego, Cal., for flying instructions. The travel directed is necessary in the military service.

The resignation by Maj. Olan C. Aleshire, Signal Corps, of his commission as temporary major of cavalry only is accepted by the President.



Some of the training machines at an aviation field "somewhere in the United States"

AUSTRIAN AGO AND LOHNER FLYING BOATS

TWO types of Austrian seaplanes which have fallen into the hands of the Italians during the present year, and regarded as worthy of special note, are the Ago and Lohner types. The Ago Sea-Pursuit Biplane described here and shown in the accompanying line drawing, bore the number "A25"; it was captured May 18, 1917. The Lohner-type flying boat (described later in this article) was brought down on the night of January 12, 1917, and it was marked "K301."

1—The Ago Sea Pursuit Biplane

In its general lines this machine does not differ much from all the flying boats of the Ago type. It does offer, however, features that are original and worthy of mention. Most striking is the structure of the wing cell in which no wires are employed.

The wing cell may be considered as consisting of two cross-networks, each made up of a front spar and a rear spar and of adjacent struts in inclined planes connecting the spars, all converging toward the center of the "star" located midway between upper and lower wings. The struts are of polished steel tubing with a fairing of laminated wood less than one mm. thick, providing a good streamlining effect.

General Dimensions

Span, upper plane	8.00 meters
Span, lower plane	7.38 meters
Chord, both planes	1.50 meters
Gap between planes	1.65 meters
Length overall	7.62 meters
Length of hull	6.50 meters
Mavimum width of hull	1.00 meter
Motor, Warschalowski	218 H.P.
Propeller, diameter	2.72 meters

No lists of weights or performances are obtainable. The accompanying sketch will give an idea of the appearance of the "A25" in flight.

Control cables to the ailerons pass close to the struts of the turret and lead to the upper plane. Each aileron is about 1.40 meters long and .40 meters wide.

The construction solution of the hull, the great care with which the exposed parts have been shaped, the complete covering or the cables and control wires, and the streamline shape of the hull, all show a desire to cut down head resistances as much as possible. Similar care is shown in all details of construction to reduce to a minimum the weight of the machine without detriment to its strength.

The hull is 6½ meters long; width at the step, .95 meters; maximum width, 1 meter; distance from bow to step, 3.45 meters; height of step, .16 meters. The shape of the body with the necessary lining at the bow and because of a careful laying of the side and bottom plating approaches very much the shape of a solid body of fairly good streamline form. The wing floats are spaced 5 meters apart. They are of streamline section, with flat sides, attached to the planes by means of one forward strut and two rear struts, with cross wire bracing between the struts.

The empannage or tail group is 2.38 meters in span, sustained in front by a vertical fin of very thin laminated wood, by two stays and two wire cables. Control wires of the rudder flaps or elevators run through the fin. The rudder is 1.40 meters high by .80 meters wide.



Sketch showing the Austrian-Ago Sea-Pursuit Biplane "A-25" in flight

The data given out concerning the motor is as follows: "Motor: Hiero Flugmotor, Osterr; Ind. Werke Warchalowski, Eissler & Co.; A-G 6 cylinders; type, HN1096. It develops 218 H.P. at 1,400 revolutions per minute. Weight 314 kilograms. It is equipped with Bosch magnetos and small starting magnetos. Propeller: 200 H.P.H. Hiero 6 cylinders; diameter, 2.72 meters; pitch, 2.25-2.40."

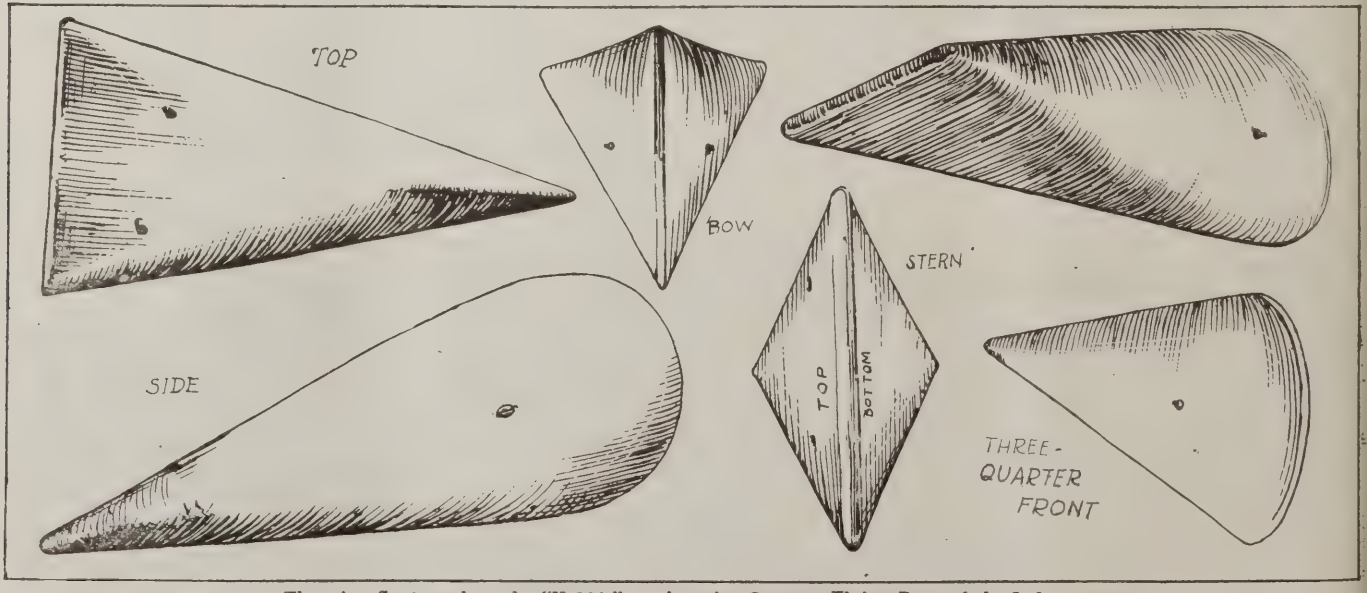
2—The Lohner Flying Boat

This is an enlarged machine of the Lohner type, retaining the V which is typical of the Lohner aeroplanes. There are six steel struts on either side and, two by two, are connected in transverse planes with steel tubes of 40 mm. outside diameter. The distance between two struts in the direction of the brace is 1.30 meters, and in the direction of the spar 2.17 meters.

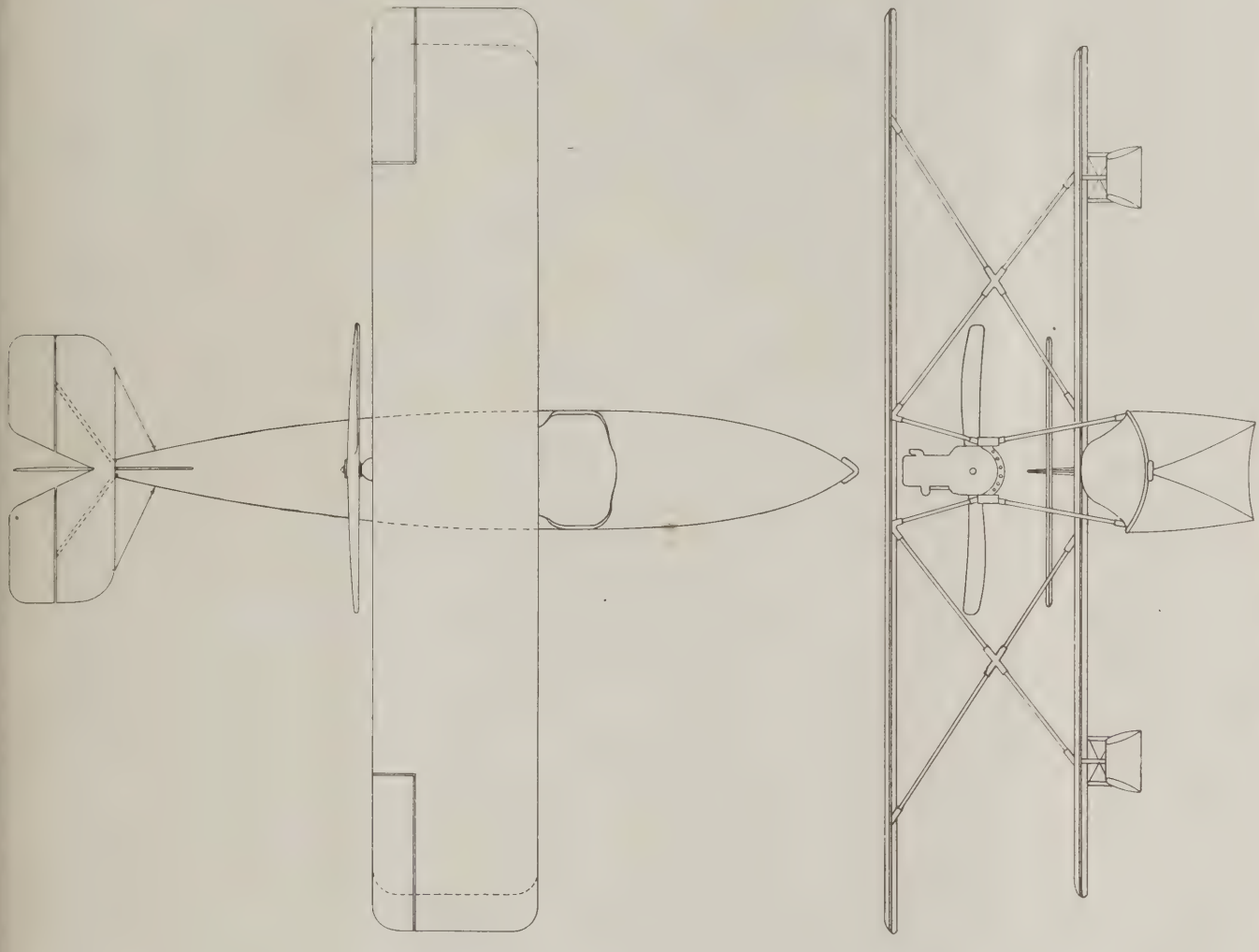
General Dimensions

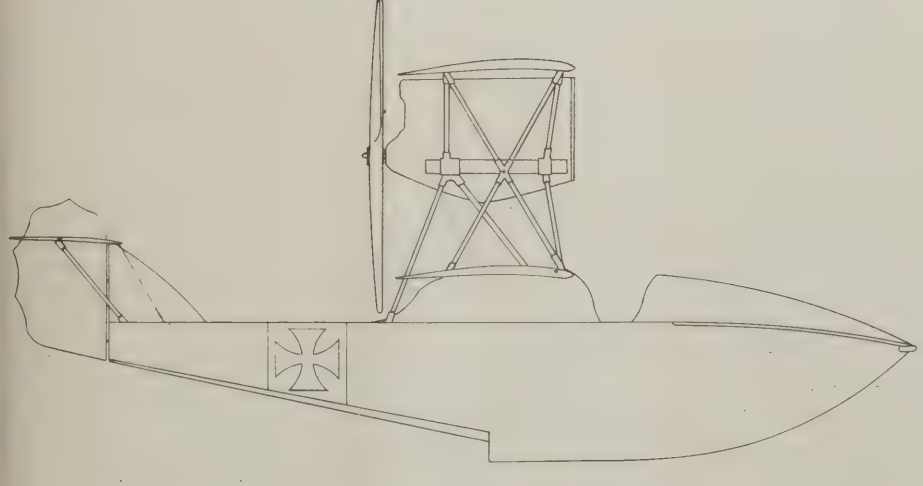
Span, upper plane	9.70 meters
Span, lower plane	7.20 meters

(*Continued on page* 665)



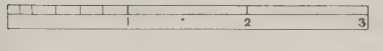
The wing float used on the "K-301," an Austrian 3-seater Flying Boat of the Lohner type





AUSTRIAN AGO TYPE
210 H.P.
SEA PURSUIT BIPLANE

Scale of Meters



McLaughlin

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Adisory Commission of the Council of National Defense has formulated the following specifications.

Specifications for Alloy Steel Tubes

GENERAL.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

USE.—2. These tubes are suitable for axles and parts subject to shock.

MATERIAL.—3. The material for these tubes shall be chosen from the I. A. S. B. standard steels listed below. The composition chosen shall be stated by the manufacturer and is further limited as follows: Carbon, not over 0.35 per cent.

MANUFACTURE.—4. (*a*) The tubes are to be of the cold-drawn, seamless type. To avoid overhardening after annealing the tube wall shall not be reduced more than 20 per cent in thickness in the final passes.

Heat Treatment.—(*b*) The tubes shall be heat treated to temper 1 or 2 as ordered. The quenching is to be done in oil.

(*c*) Any tube may be rejected at any time because of injurious defects or faults in the steel which are revealed by manufacturing operations, notwithstanding the fact that it has previously passed inspection. Such rejected material shall be returned to the manufacturer at the latter's expense. This clause shall not apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubes are to be smooth, of the section specified, and within the permissible tolerances as to wall thickness; of uniform diameter, free from scale, dirt, specks, longitudinal seaming, lamination, grooving, and blistering, both internally and externally.

PHYSICAL PROPERTIES AND TESTS.—6. The tubes shall have the following physical properties:

Tensile Test.—(*a*)

TEMPER I.

Minimum tensile strength 110,000 pounds per square inch (77.33 kg./mm.²).
Minimum yield point, 90,000 pounds per square inch (63.27 kg./mm²).
Minimum elongation, 15 per cent in 2 inches (50.8 mm.) or 5 per cent in 8 inches (203.2 mm.).

TEMPER II.

Minimum ultimate strength, 85,000 pounds per square inch (59.76 kg./mm.²).
Minimum yield point, 60,000 pounds per square inch (42.18 kg./mm.²).
Minimum elongation, 25 per cent in 2 inches (50.8 mm.) or 10 per cent in 8 inches (203.2 mm.).

Crushing Test.—(*b*) The test specimen shall be crushed endwise until the outside diameter is increased in one zone by 25 per cent, or until one complete fold is formed. The specimen must stand this treatment without cracking.

SELECTION OF TEST SPECIMENS.—7. One test specimen for the tensile test shall be chosen from every 400 feet (121.9 m.) of tubing and one test specimen for the crushing test from every 100 feet (30.5 m.) of tubing.

The specimens for the crushing tests shall have a length of 1.5 times the diameter of the tube.

Whenever possible the selection of test specimens shall be made by heats.

DIMENSIONS AND TOLERANCES.—8. (*a*) The following tolerances will be allowed on the outside diameter of tubes:

Tubes under 1.5 inches (38.1 mm.) diameter, ±0.003 inch (0.08 mm.).
Tubes over 1.5 inches (38.1 mm.) diameter, ±0.005 inch (0.13 mm.).

The manufacturer and purchaser shall agree upon tolerances for coulissant or telescoping tubes.

(*b*) The variation in wall thickness may be ±10 per cent of the dimension specified.

(*c*) In no part of any tube shall the departure from straightness exceed 1 in 600.

DELIVERY, PACKING, AND SHIPPING.—9. All tubes shall be well oiled and delivered in boxes not exceeding 220 pounds (100 kg.) gross weight.

Specifications for Medium Carbon Steel Tubes

GENERAL.—1. The general specifications 1G1, shall form, according to their applicability, a part of these specifications.

USE.—2. These tubes are suitable for stressed parts, such as braces and tie tubes.

MATERIAL.—3. The I. A. S. B. standard steel No. 1035 shall be used. Its composition is as follows:

	Per cent.
Carbon	0.30–0.40
Manganese	.50– .80
Phosphorus, maximum	.045
Sulrphur, maximum	.050

When electric or crucible furnace steel is specified in the order, the maximum allowable percentages of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

MANUFACTURE.—4. (*a*) The tubes are to be of the cold-drawn, seamless type.

Heat Treatment.—(*b*) The tubes shall be heat treated to give the physical properties specified. It is desirable that they be quenched in oil.

(*c*) Any tube may be rejected at any time because of injurious defects or faults in the steel which are revealed by manufacturing operations, notwithstanding the fact that it has previously passed inspection. Such rejected material shall be returned to the manufacturer at the latter's expense. This clause shall not apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubes are to be smooth, of the section specified, and within the permissible tolerances as to wall thickness, of uniform diameter, free from scale, dirt, specks, longitudinal seaming, lamination, grooving and blistering, both internally and externally.

PHYSICAL PROPERTIES AND TESTS.—6. The tubes shall have the following physical properties:

Tensile Test.—(*a*)

Minimum tensile strength, 80,000 pounds per square inch (56.24 kg./mm.²).
Minimum yield point, 60,000 pounds per square inch (42.18 kg./mm.²).
Minimum elongation, either 20 per cent in 2 inches (50.8 mm.) or 12 per cent in 8 inches (203.2 mm.).

Crushing Test.—(*b*) The test specimen shall be crushed endwise until the outside diameter is increased in one zone by 25 per cent, or until one complete fold is formed. The specimen shall stand this treatment without cracking.

SELECTION OF TEST SPECIMENS.—7. One test specimen for the tensile test shall be chosen from every 400 feet (121.9 m.) of tubing and one test specimen for the crushing test from every 100 feet (30.5 m.) of tubing.

The specimens for the crushing tests shall have a length of 1.5 times the diameter of the tube.

Whenever possible the selection of test specimens shall be made by heats.

DIMENSIONS AND TOLERANCES.—8. (*a*) The following tolerances will be allowed on the outside diameter of tubes:

Tubes under 1.5 inches (38.1 mm.) diameter, ±0.003 inch (0.08 mm.).
Tubes over 1.5 inches (38.1 mm.) diameter, ±0.005 inch (0.13 mm.).

The manufacturer and purchaser shall agree upon tolerances for coulissant or telescoping tubes.

(*b*) The variation in wall thickness may be ±10 per cent of the dimension specified.

(*c*) In no part of any tube shall the departure from straightness exceed 1 in 600.

DELIVERY, PACKING, AND SHIPPING.—9. All tubes shall be well oiled and delivered in boxes not exceeding 220 pounds (100 kg.) gross weight.

Specifications for Welded Steel Tubes

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

USE.—2. These tubes are suitable only for unstressed parts, such as conduit tubes.

MATERIAL.—3. The I. A. S. B. standard steel No. 1020 shall be used. Its composition is as follows:

	Per cent.
Carbon	0.15–0.25
Manganese	.30– .60
Phosphorus, maximum	.045
Sulphur maximum	.050

MANUFACTURE.—4. All tubes shall be of the welded type. They must be carefully annealed before the final pass.

Any tube may be rejected at any time because of injurious defects or faults in the steel which are revealed by manufacturing operations, notwithstanding the fact that it has previously passed inspection. Such rejected material shall be returned to the manufacturer at the latter's expense. This clause shall not apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubes are to be smooth, of the section specified, and within the permissible tolerances as to wall thickness, of uniform diameter, free from scale, dirt, specks longitudinal seaming, lamination, grooving, and blistering, both internally and externally.

PHYSICAL PROPERTIES AND TESTS.—6. The tubes shall have the following physical properties:

Crushing Test.—One test specimen from every 100 feet (30.5m.) of tubing is to be crushed endwise until the outside diameter is increased in one zone by 25 per cent, or until one complete fold is formed. The specimen shall stand this treatment without cracking.

Chemical composition of standard alloy steels

NICKEL STEELS

Number.	Carbon.	Manganese.	Phosphorus maximum.	Sulphur, maximum.	Nickel.	Chromium.
2320	.15– .25	.30– .60	.040	.045	3.25–3.75	.....
2325	.20– .30	.50– .80	.040	.045	3.25–3.75	.....
2330	.25– .35	.50– .80	.040	.045	3.25–3.75	.....

CHROMIUM VANADIUM STEELS.

Number.	Carbon.	Manganese.	Phosphorus maximum.	Sulphur, maximum.	Chromium.	Vanadium, minimum.
6120	0.15–0.25	0.30–0.60	0.040	0.045	0.60–0.90	0.15
6130	.25– .35	.50– .80	.040	.045	.80—1.10	.15

Whenever possible the selection of test specimens shall be made by heats.

The specimens for the crushing tests shall have a length of 1.5 times the diameter of the tube.

DIMENSIONS AND TOLERANCES.—7 (*a*). The following tolerances will be allowed on the outside diameter of tubes:

Tubes under 1.5 inches (38.1 mm.) diameter, ±0.005 inch (0.13 mm.).
Tubes over 1.5 inches (38.1 mm.) diameter, ±0.010 inch (0.25 mm.).

(*b*) The variation in wall thickness may be ± 10 per cent of the dimension specified.

(*c*) In no part of any tube shall the departure from straightness exceed 1 in 600.

DELIVERY, PACKING, AND SHIPPING.—8. All tubes shall be well oiled and delivered in boxes not exceeding 220 pounds (100 kg.) gross weight.

Tolerances on Steel Bars, Sheets, Tubes, Wires, and Cables

The following tables and text indicate the tolerances which will be considered standard for the I. A. S. B.:

TABLE 1.—*Standard steel bars, round or square*

Hot rolled.				Bright rolled and drawn.			
Size of bar (diameter or width across flats).		Tolerance.		Size of bar (diameter or width across flats).		Tolerance.	
Inches.	*Millimeters.*	*Inch.*	*Millimeters.*	*Inches.*	*Millimeters.*	*Inch.*	*Millimeter.*
0–0.875	0– 22.23	+0.010	+0.25	0–0.563	0– 14.30	—0.002	—0.05
0.876–1.250	22.25– 31.75	+ .015	+ .38	0.564–1.125	14.33– 28.58	— .003	— .08
1.251–1.625	31.78– 41.28	+ .020	+ .51	1.126–1.875	28.60– 47.63	— .004	— .10
1.626–1.875	41.30– 47.63	+ .025	+ .64	1.876–3.000	47.65– 76.20	— .005	— .13
1.876–3.000	47.65– 76.20	+ .050	+1.27	3.001–4.000	76.23–101.60	— .006	— .15
3.001–4.000	76.23–101.60	+ .075	+1.91	4.001–5.000	101.63–127.00	— .007	— .18
4.001–5.000	101.63–127.00	+ .100	+2.54	5.001	127.03	— .008	— .20
5.001	127.03	+ .150	+3.81				

TABLE 2.—*Standard steel bars, hexagon*

Hot rolled.				Bright rolled and drawn.			
Size of bar (width across flats).		Tolerance.		Size of bar (width across flats).		Tolerance.	
Inches.	*Millimeters.*	*Inch.*	*Millimeter.*	*Inches.*	*Millimeters.*	*Inch.*	*Millimeter.*
0–0.875	0–22.23	+0.010	+0.25	0–0.563	14.30	—0.002	—0.05
0.876–1.250	22.25–31.75	+ .015	+ .38	0.564–0.938	14.32–23.83	— .003	— .08
1.251–2.000	31.78–50.80	+ .020	+ .51	0.939–2.000	23.85–50.80	— .004	— .10
2.001–3.000	50.83–76.20	+ .025	+ .64	2.001–3.000	50.83–76.20	— .005	— .13
3.001	76.23	+ .030	+ .76	3.001	76.23	— .006	— .15

TABLE 3.—*Standard steel sheets*

Thickness.		Tolerance for sheets 14 inches (355.6 mm.) wide and under.		Tolerance for sheets over 14 inches (355.6 mm.) wide.	
Inch.	*Millimeters*	*Inch.*	*Millimeter.*	*Inch.*	*Millimeter.*
0–0.020	0–0.51	+0.001 — .002	+0.03 — .05	±0.002	±0.05
0.021–.030	0.53– .76	+ .002 — .003	+ .05 — .08	± .003	± .08
.031–.040	.79–1.02	± .003	± .08	± .003	± .08
.041–.050	1.04–1.27	± .003	± .08	± .004	± .10
.051–.065	1.30–1.65	± .004	± .10	± .004	± .10
.066–.080	1.68–2.03	± .004	± .10	± .005	± .13
.081–.100	2.06–2.54	± .006	± .15	± .006	± .15
.101–.120	2.57–3.05	± .006	± .15	± .007	± .18
.121–.250	3.07–6.35	± .006	± .15	± .008	± .20

STEEL TUBES.—1. The following tolerances will be allowed on the outside diameter of tubes:

Seamless tubes:
For tubes under 1.5 inches (38.1 mm.) diameter ±0.003 inch (0.08 mm.).
For tubes over 1.5 inches (38.1 mm.) diameter ±0.005 inch (0.13 mm.).

Welded tubes:
For tubes under 1.5 inches (38.1 mm.) diameter ±0.005 inch (0.13 mm.).
For tubes over 1.5 inches (38.1 mm.) diameter ±0.010 inch (0.25 mm.).

The tolerances on coulissant or telescoping tubes shall be decided between manufacturer and purchaser.

The permissible limit of variation of wall thickness shall be ± 10 per cent of the dimensions specified.

WIRES AND CABLES.—2. The following tolerances will be allowed on wires and cables:

High-Strength Steel Wire.—(*a*) A permissible variation of 0.002 inch (0.051 mm.) above gauge on all sizes will be accepted, but no wire will be accepted having a variation of more than 0.0005 inch (0.013 mm.) below gauge.

19 Nonflexible Steel-Wire Cable.—(*b*) There shall be no permissible variation in diameter below size. Cable having a diameter of 0.031 ($\frac{1}{32}$) to 0.156 ($\frac{5}{32}$) inch (0.79 to 3.97 mm.), inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 0.1875 ($\frac{3}{16}$) to 0.375 ($\frac{3}{8}$) inch (4.76 to 9.53 mm.), inclusive, shall have a permissible variation of 7 per cent above size.

7 x 7 Flexible Steel-Wire Cable.—(*c*) There shall be no permissible variation in diameter below size. Cable having a diameter of 0.063 ($\frac{1}{16}$) to 0.094 ($\frac{3}{32}$) inch (1.59 to 2.38 mm.), inclusive, shall have a permissible variation of 12 per cent above size; cable having a diameter of 0.125 ($\frac{1}{8}$) to 0.187 ($\frac{3}{16}$) inch (3.18 to 4.76 mm.), inclusive, shall have a permissible variation of 10 per cent above size; and cable having a diameter of 0.2187 ($\frac{7}{32}$) to 0.375 ($\frac{3}{8}$) inch (5.56 to 9.53 mm.), inclusive, shall have a permissible variation of 7 per cent above size.

7 x 19 Extra Flexible Steel-Wire Cable.—(*d*) There shall be no permissible variation in diameter below size. Cable having a diameter of 0.125 ($\frac{1}{8}$) to 0.187 ($\frac{3}{16}$) inch (3.18 to 4.76 mm.) inclusive, shall have a permissible variation of 10 per cent above size; and cable having a diameter of 0.218 ($\frac{7}{32}$) to 0.375 ($\frac{3}{8}$) inch (5.56 to 9.53 mm.), inclusive, shall have a permissible variation of 7 per cent above size.

Specifications for Mild Carbon Steel Tubes

GENERAL.—1. The general specifications, 1G1, shall form according to their applicability, a part of these specifications.

USE.—2. These tubes are suitable for all parts not heavily stressed, such as trailing edges and elevators.

MATERIAL.—3. The I. A. S. B. standard steel No. 1020 shall be used. The composition is as follows:

	Per cent.
Carbon	0.15–0.25
Manganese	.30– .60
Phosphorus, maximum	.045
Sulphur, maximum	.050

MANUFACTURE.—4. The tubes are to be of the cold-drawn, seamless type and are to be furnished annealed.

Any tube may be rejected at any time because of injurious defects or faults in the steel which are revealed by manufacturing operations, notwithstanding the fact that it has previously passed inspection. Such rejected material shall be returned to the manufacturer at the latter's expense. This clause shall not apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubes are to be smooth, of the section specified, and within the permissible tolerances as to wall thickness, of uniform diameter, free from scale, dirt, specks longitudinal seaming, lamination, grooving, and blistering, both internally and externally.

PHYSICAL PROPERTIES AND TESTS.—6. The tubes shall have the following physical properties:

Tensile Test.—(*a*)
Minimum tensile strength, 60,000 pounds per square inch (42.18 kg./mm.²).
Minimum yield point, 36,000 pounds per square inch (25.31 kg./mm.²).
Minimum elongation, 25 per cent in 2 inches (50.8 mm.) or 10 per cent in 8 inches (203.2 mm.).

Crushing Test.—(*b*) The test specimen shall be crushed endwise until the outside diameter is increased in one zone by 25 per cent, or until one complete fold is formed. The specimen shall stand this treatment without cracking.

SELECTION OF TEST SPECIMENS.—7. One test specimen for the tensile test shall be chosen from every 400 feet (121.9 m.) of tubing and one test specimen for the crushing test from every 100 feet (30.5 m.) of tubing.

The specimens for the crushing tests shall have a length of 1.5 times the diameter of the tube.

Whenever possible the selection of test specimens shall be made by heats.

DIMENSIONS AND TOLERANCES.—8. (*a*) The following tolerances will be allowed on the outside diameter of tubes:

Tubes under 1.5 inches (38.1 mm.) diameter, ±0.003 inch (0.08 mm.).
Tubes over 1.5 inches (38.1 mm.) diameter, ±0.005 inch (0.13 mm.).

The manufacturer and purchaser shall agree upon tolerances for coulissant or telescoping tubes.

(*b*) The variation in wall thickness may be ± 10 per cent of the dimension specified.

(*c*) In no part of any tube shall the departure from straightness exceed 1 in 600.

DELIVERY, PACKING AND SHIPPING.—9. All tubes shall be well oiled and delivered in boxes not exceeding 220 pounds (100 kg.) gross weight.

(*Continued on page 665*)

THE 320 H. P. LANCIA AEROPLANE ENGINE

A 320 H.P. aeroplane engine the product of the well-known makers of the Lancia automobile, has just made its appearance in this country. One of the Lancia aeroplane engines has been shipped to Thomas Evarts Adams, Inc., representative in America of the Lancia Company of Turin, Italy, and it is now on exhibition at the company's showrooms, 236 W. 59th St., New York City. Within a few weeks it is expected that demonstration tests will be made.

General

There are twelve steel cylinders arranged on an aluminum crankcase at a 50 degree V. Bore, 120 mm (about 4¾ inches); stroke, 180 mm (about 7 3/32 inches); cylinder displacement about 1490 cu. in. The normal brake horsepower is 320 at 1,380 revolutions per minute. Weight, complete, 740 pounds; about 2.31 pounds per b.h.p. Piston speed, 1630 ft. per minute; brake mean effective pressure, 122 lbs. per sq. inch. The company also makes an "oversize" motor of the same type with slightly larger pistons and valves which develops 380 h.p. at 1420 r.p.m.

Cylinders

The cylinders are of steel, machined both inside and out, attached to the crankcase by bolts passing through the holding-down flange which is screwed and welded at the base of each cylinder. The cylinders project into the crankcase beyond the holding-down flanges for a distance of 1¼ inches.

Each cylinder unit consists of a steel cylinder and steel head, surrounded by a pressed steel water jacket which is welded on a short distance above the crankcase. A water cooling space of .5 cm (about 3/16 inch) is provided around the cylinders. A water circulation is also provided around the valves.

Intake and exhaust valves are located overhead, one of each to a cylinder, all operated by a single camshaft. They are set side-by-side at right angles to the centerline of the cylinder. Exhaust gases are led through a short manifold at the top of the cylinder.

Camshaft

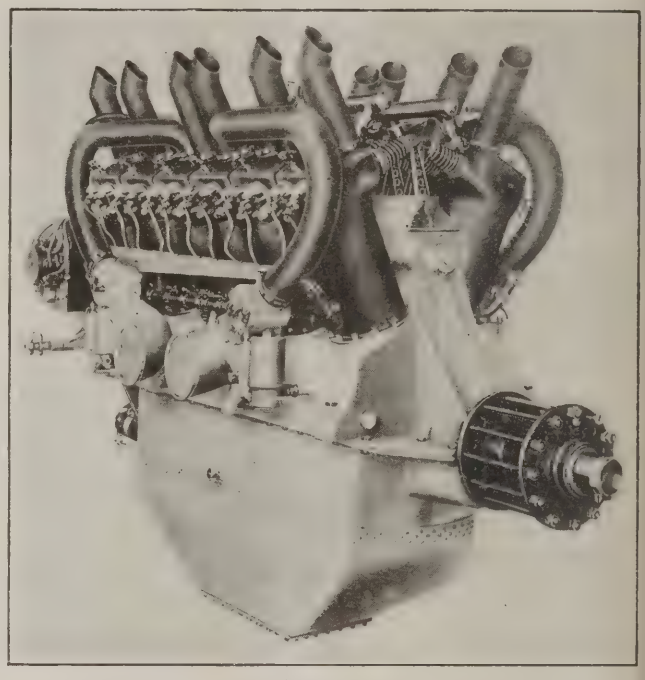
The camshaft is hollow, carried in a compartment set above the center of the engine. The housing for the rocker arms is readily detachable from the crankcase, interchangeable in three sections.

The 24 rock levers are of channelled steel, each 7⅞ inches long, upper ends provided with set screws and set locks to allow for adjustment, central hollow spindles carrying each group of 8 rockers. The roller at the lower end of the rocker (which comes in contact with the cam) is 3½ inches below the spindle.

Each valve is closed by coiled volute spring surrounding the valve stem.

Pistons

Pistons are of cast aluminum, with reinforcing webs provided on the interior wall and lightening holes at the bottom of the skirt. There are three piston rings above the wrist pin and one below it.



Propeller end of the 320 H.P. Lancia aeroplane engine

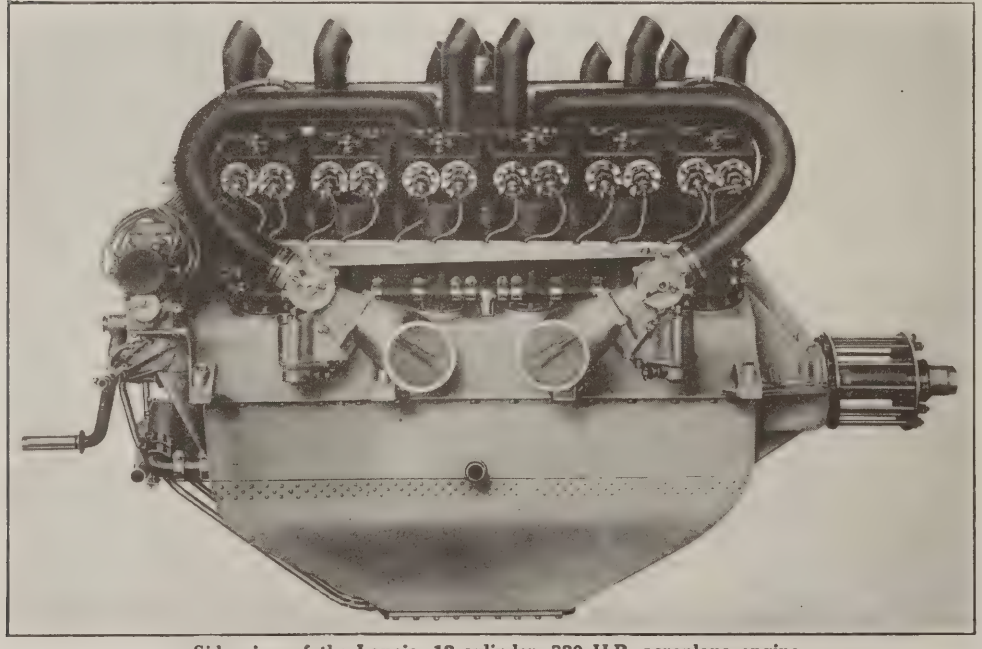
Connecting rods are drop forgings of the usual I section, tapering toward the top. Lower bearing is in two parts, held with a pair of bolts, to facilitate clamping around the crankshaft.

Crankshaft

The six-throw type crankshaft is of chrome nickel steel carried on five bearings. The propeller thrust is taken up by a set of self-aligning ball bearings at the propeller end of the crankshaft.

At each throw of the crankshaft, two connecting rods are attached, one behind the other, causing the cylinders on one side of the V to be slightly behind those on the other side. The two opposing connecting rods are set off center on each throw of the crankshaft.

The crankshaft is hollow and holes are provided through which the lubricating oil is fed at high pressure to the bearings.



Side view of the Lancia, 12-cylinder, 320 H.P. aeroplane engine

Lubrication

A double independent oiling system is used with two impelling gear pumps at the magneto end. The catch-drain in the bottom of the crankcase is designed to insure a constant supply of oil to the pump at all possible flying angles. The lubrication system is exactly similar to that used in the Lancia automobile.

Carburetion

Four Claudel-Lancia carburetors are used, two on each side of the engine, each serving three of the cylinders. Each carburetor has a barrel type throttle valve and gasoline control. Controls are synchronously operated by rods running to a master regulating arm. The carburetor inlets are situated on the outside of the V. Air is drawn into the carburetors through funnels with fine gauze-covered openings. The water piping is carried in a section of the intake manifold, as a means of heating the mixture.

(*Continued on page* 653)

STUNT FLYING AND AERIAL COMBAT

WHEN Lincoln Beachey and those immediately following him first evolved the numerous aerial evolutions known as "Stunts," little did the world at large realize the tremendous effect that they were to have in the world war shortly to come. Indeed, these exhibition pilots were looked upon as a reckless offshoot of a foolhardy pursuit. Even those pilots who did nothing but straight flying had not arrived at ths knowledge that the more dangerous positions a man could place his machine in and then right it, just so much more efficient he would be in the correction of an *accidental* mishap; that in the case of a fall of any kind he would have a ready formula for its correction, and that the application of that formula would have become absolutely instinctive. On the whole, every stunt possible to achieve with an aeroplane has its military value, both as a means of attack and of escape. The writer will discuss some of the more impotrant evolutions and their military value.

The Zoom is an almost vertical climb—the amount of climb, and the angle of attack depending upon the type of machine used, and the speed possible to be obtained from it. The pilot puts his machine in a position of zero angle of incidence, or points it slightly downward, attaining a speed in excess of the normal speed of the type. He then quickly pulls his elevator control toward his body, and machine points upward in an almost vertical climb for fifty to eighty feet. As he nears the top of the climb he eases the controls forward again and the machine takes the normal flying angle.

Now as to the military value: Consider that our pilot is driving a speed scout with one machine gun, shooting through the propeller. He has come under an enemy machine, but in such a position that he is unable to shoot effectively. He quickly shoots upward, and when the other machine comes into line, fires a round at him. If a hit is attained, all is well, but if a hit is not made, he must either return immediately to the attack or get out of danger. Whatever his choice he must depend on one of three evolutions to achieve his purpose. These evolutions are as follows: The Whip Dive, the Slide Slip and the Loop.

We will consider that he wishes to return at once to the attack. He chooses the Whip Dive. He may shut off his motor and point his machine at the *critical angle;* that is, the angle at which the lift is at its minimum. The consequence is a *stall,* and the nose of his machine suddenly whips downward, and he goes into a precipitous nose dive. As he passes his adversary he may fire another round and then make his getaway with the surplus speed he has attained in his dive or simply dive out of range.

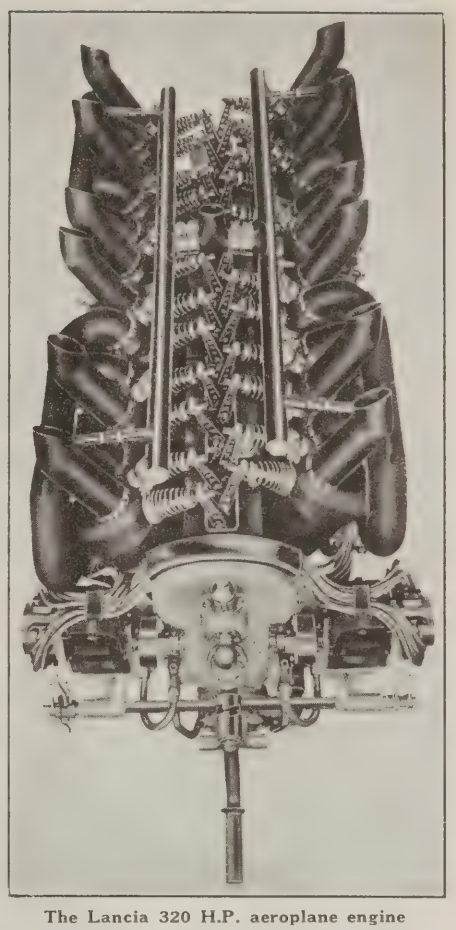
It may be, however, that his adversary is directly below him in such a position that our pilot cannot dive directly downward. He then may make use of the Side Slip. To do this he turns his wheel in either direction as far as it will go. The machine rolls over sideways and falls in this position with almost as much speed as is attained in the case of the nose dive. When he has fallen a sufficient distance he rudders into the slip by pushing the rudder on the side in which he has fallen. This brings him into a nose dive and he comes out by pulling his elevator toward him and coming out in a gradual glide.

In the case of the loop this may be done as part of the zoom; that is, making the speed a little greater, zooming upward and going into a loop where he comes down directly upon his opponent's tail.

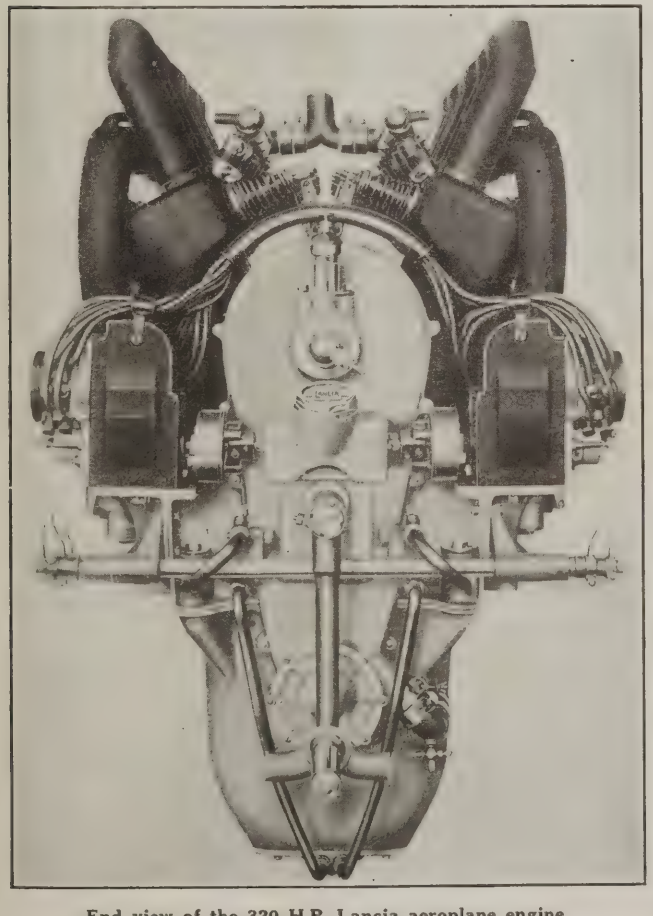
The side slip and the nose dive, in addition, are of special advantage when one aviator is set upon by superior numbers. He then can use either method to dive out of range. The only fault to the nose dive as a means of escape is that it is fairly easy for the adversary to follow down in a nose dive of his own, pouring bullets into the man below. So in the majority of cases the Tail Spin is substituted for the nose dive.

The Tail Spin may be accomplished by a great amount of bank with no rudder compensation or vice versa. The machine then will fall nose down, spinning about its fore and aft axis, but with the tail making larger circles than the nose. This is almost impossible to follow and shoot at with any degree of accuracy. To get out of a nose dive the pilot pushes his elevator control forward, going into a nose dive, and then coming out by the method described above.

It will be seen at a glance that all these evolutions are of immense advantage to the aviator. Every American aviator who drives a fighting machine will be well versed in these evolutions, which are given to him in his course in advanced flying.



The Lancia 320 H.P. aeroplane engine



End view of the 320 H.P. Lancia aeroplane engine

The 320 H. P. Lancia Aeroplane Engine

(*Continued from page* 652)

Ignition

Two Dixie 12-cylinder magnetos are set on bases cast integral with the crankcase at the rear of the engine. They are driven from the cam-gear through a pair of spiral gears and a cross shaft. Each is provided with an automatic advance and driven through a coupling permitting quick removal. Two 6-cylinder magnetos and a distributor may be used in place of the 12-cylinder magnetos; or a magneto and battery system.

Each cylinder is provided with two Lodge spark plugs, located on the outside of the V, opposite and in line with the inlet and exhaust valves. Their firing order is as follows: beginning at the propeller end—right cylinders, 7, 11, 3, 9, 5, 1; beginning at the propeller end—left cylinders, 2, 6, 10, 4, 12, 8.

Consumption and Weight Comparison of Typical 100 H. P. Engines

Type of Engine	Cooling	Cylinders	R.P.M.	Gasoline Used Per H. P. Hour	Oil Used Per Hour	Weight Engine Only		Gasoline, Oil and Tank, Weight Per Hour
						Per H. P.	Total	
				Pint.	Gals.	Lbs.	Lbs.	Lbs.
Vertical..	Water..	6	1,300	0.55	0.3	5.4	540	63
Vee.....	"	8	1,800	0.61	0.8	5.1	510	76
Radial....	"	7	1,250	0.63	0.5	4.8	480	74
Vee.....	Air.....	8	1,800	0.67	1.5	4.	400	91
Radial....	"	10	1,250	0.7	1.7	3.6	360	96
Rotary..	"	9	1,200	0.8	.2	2.8	280	108

The weights of the water-cooled engines include the necessary radiator and cooling water. Radiator weight=0.75 lb. per B.H.P. Cooling water weight = 0.3-0.5 lb. per B.H.P.

If the weight of all parts is not known, taking E as the weight of the engine in lbs., allow: Rotary engine mounting $= \frac{1}{8} E$; Stationary engine mounting $= 1/12\ E$; rotary engine cowling $= 2\sqrt{E}$; stationary engine mounting $= \sqrt{E}$; propellers $= 2.5\ E$. Tanks $= \frac{1}{5}$ wt. of contents. Gasoline $=$ 7.2 lbs. per gal. Oil $=$ 10 lbs. per gal.

SOME NOTES ON THE AIRSCREW AND THE PROBLEM OF OPTIMUM DIAMETER

By E. P. KING, B.Sc. (Eng.), Lond.*

THE best diameter for a propeller is that at which, for any particular set of conditions imposed, the efficiency curve reaches its maximum value. It is important to observe that this diameter varies with the power and revolutions of engine, the speed of the aircraft and the type of propeller used, so that theoretically speaking every manœuvre of the pilot should be accompanied by an appropriate change in propeller diameter. Generally, we may say, a propeller suitable for speed will not be the most favorable one to use under climbing conditions, the required diameter being much larger in the latter case, and *vice versa*. An expanding and contracting propeller such as the theory requires is more or less a practical impossibility, so we are forced to an engineering compromise, and for any particular case, select a value for the diameter which will give the best all-around performance of the machine, due consideration being given to any special requirements in speed or climb.

The present paper merely shows the *method* of determination which may be employed in a particular case where the restrictions as to engine power, speed, and revolutions are completely defined. In order to show the advantage of taking any other speed or revolution limitation it will be necessary to repeat the process to suit the new conditions. To completely represent the case so that the best efficiency-diameter values may be found directly for any power, speed, or revolutions which may be selected, it would be necessary to calculate a large number of curves—one series for constant power and speed but varying revolutions; another for constant power and revolutions but varying speed; and a set of these for each engine-power which may be available. This involves a great deal of laborious work, but given accurate and reliable correction factors for aspect ratio, interference, etc., the efficiency curves so obtained would be invaluable in selecting the power unit, gear ratio, etc., most appropriate to any particular machine. Mr. F. W. Lanchester** has given a useful general analysis of the problem which, by the substitution of actual experimental aerofoil constants for theoretically derived values, has been found to give very consistent results.

The Newtonian Method

Consider, in the first place, the case of the ideal air actuator deriving its thrust in accordance with Newton's Second Law of Motion† from a cylindrical column of air moving backwards from the propeller at some velocity greater than that of the incoming air. It will be obvious that, in order to preserve continuity of motion, the same quantity of air per second, m, must pass through each of

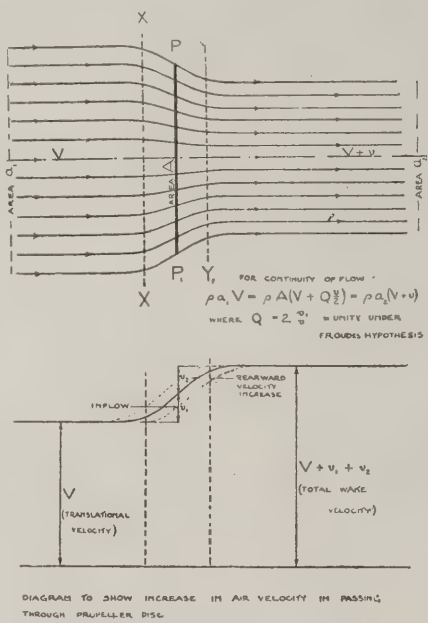


Figure 1

the sections immediately fore and aft of the median plane, and that, in consequence of the added velocity rearwards, there will be a contraction of the slip stream somewhat as shown in Fig. 1. Hence assuming no air leakage at the sides, we may write:

$$\frac{a_1}{a_2} = \frac{V + v}{V}\ddagger.$$

‡ a_1 area of stream before disturbance
a_2 area of stream immediately afterwards
V = translational velocity of propeller
v = total added slip velocity
v_1 = additional forward velocity or inflow velocity
v_2 = additional rearward velocity

It is assumed in the case of the ideal actuator that the *whole* wake stream can be so dealt with that it shall have uniform motion over its entire cross-section. A propeller which will handle the air in such an ideal way is a practical impossibility although it is conceivable that much could be done by employing a very large number of thin narrow blades. We shall see presently that the stream affected in the case of an actual two-bladed ten-foot propeller is only between 15 and 30 per cent. of the full stream area; so it will not be surprising that there is considerable divergence between the results obtained under ideal and actual conditions. Even so, the Newtonion efficiency curve is useful as showing the increase in efficiency which may be expected with large diameters if at some future date it becomes an engineering possibility to deal with the air in the way supposed.

In seeking to apply the momentum equation to the case of a body in motion in a fluid, we are at once confronted with the difficulty of determining the amount of air dealt with per second. This quantity will obviously depend in some way on the shape, size, and attitude of the body in the stream of fluid, the relation being difficult to determine with any degree of accuracy. Reverting to the ideal actuator shown in Fig. 1, it will be obvious that the mass of air per second passing the median plane, PP, is given by the expression:

$$m = \frac{\rho}{g} A V^1$$

the velocity of the stream, V^1 at the moment of crossing the disc depending on the curve of velocity distribution. In the hypothesis adopted by Dr. R. E. Froude this velocity curve is assumed to be symmetrical, as shown by the full line in the figure, one-half the added velocity being

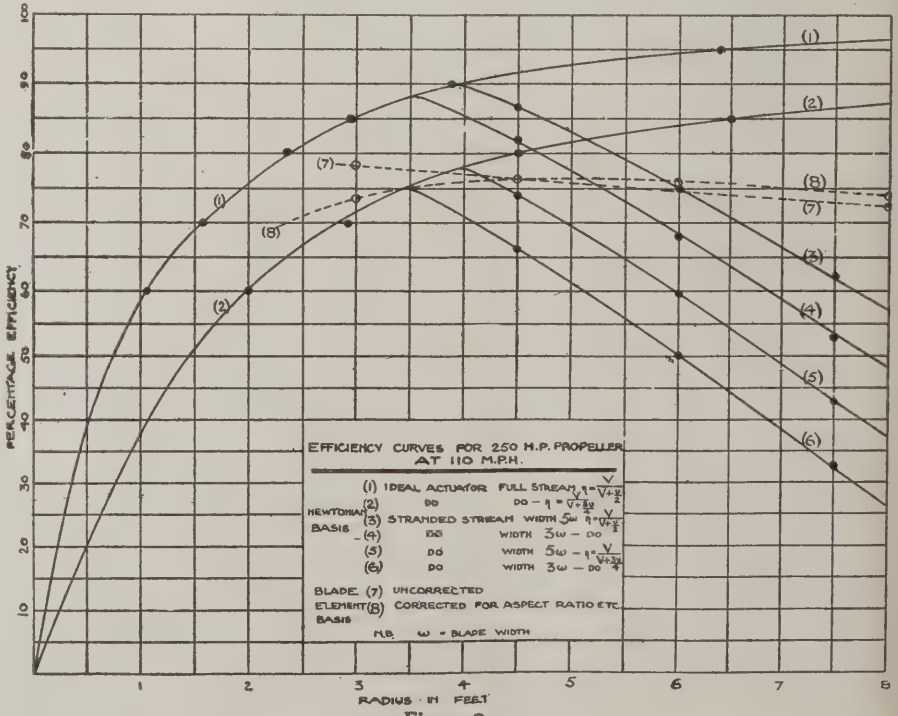


Figure 2

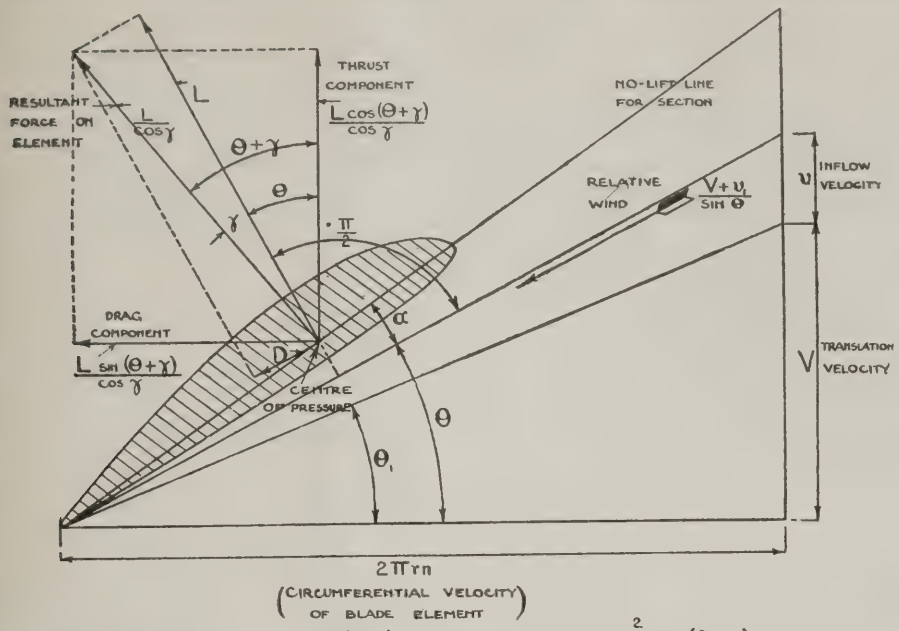
* Courtesy of London *"Aeronautics."*

** *Proc. Inst. Automobile Engineers,* "The Second Propeller," by F. W. Lanchester, vol ix, 1915.

† "Rate of change of momentum is proportional to the impressed force and takes place in the direction of the straight line in which the force acts." Using the usual notation:

$$F = \frac{mv}{t}$$

which in the case of fluids is equal to the product of mass per second and velocity increase.



$$\text{TOTAL THRUST} = \sum \frac{L\cos(\Theta+\gamma)}{\cos\gamma} = \sum \frac{\rho}{g} K_y \omega \left(\frac{V+v_1}{\sin\Theta}\right)^2 \frac{\cos(\Theta+\gamma)}{\cos\gamma}$$

$$\text{TOTAL DRAG} = \sum \frac{L\sin(\Theta+\gamma)}{\cos\gamma} = \sum \frac{\rho}{g} K_y \omega \left(\frac{V+v_1}{\sin\Theta}\right)^2 \frac{\sin(\Theta+\gamma)}{\cos\gamma}$$

$$\text{TOTAL TORQUE} = \sum \frac{\rho}{g} K_y \omega \left(\frac{V+v_1}{\sin\Theta}\right)^2 \frac{\sin(\Theta+\gamma)}{\cos\gamma} \times \text{RADIUS OF ROTATION}$$

Figure 3

imparted to the air just in *front* of median plane and one-half *behind*. This is the convention generally used in the absence of any reliable experimental results or other sufficiently authenticated rule, although, as pointed out by Mr. Lanchester in the paper already referred to, it would be better to express the velocity at the disc and the mass per second thus:

$$V^1 = V + Q\frac{v}{2}$$

$$m = \rho\left(V + Q\frac{v}{2}\right) \quad . \quad . \quad . \quad . \quad (1)$$

where Q is a constant which may or may not be unity. If Q is equal to unity we have Dr. Froude's assumption, while if greater or less than this the velocity distribution curve will follow the upper or lower broken lines shown in the figure. In seeking to write down an expression for the thrust of the ideal propeller by the Newtonian equation, we immediately come on to controversial ground. Thus, while it is usual, and certainly reasonable, to consider the *whole* of the added wake velocity, v, as affecting the thrust, it has been contended by some, and by Prof. Henderson in particular, that only the rearward addition, v_2, contributes to this end, the extra velocity, v_1, forward of the blades forming part of a conservative system not represented in the useful work done. We are not in a position to enter into the *pros* and *cons.* of the discussion here, but will merely content ourselves with writing down the results to which we are led in the two cases. First, assuming the whole of the added wake contributes to the thrust, we have:

$$(1)\quad \text{efficiency} = \frac{\text{useful work done}}{\text{total work expended}}$$

$$= \frac{\text{thrust} \times \text{velocity}}{\text{extra kinetic energy in wake stream}}$$

$$\text{or } \eta = \frac{mvV}{\frac{1}{2}m[(V+v)^2 - V^2]} = \frac{V}{V+\frac{1}{2}v} \quad (2)$$

$$= \frac{V}{V+v_1} = \frac{V}{V+v_2} \text{ if } v_1 = v_2 = \frac{v}{2}$$

Secondly, under Prof. Henderson's hypothesis we have:

$$(2)\quad \eta = \frac{mv_2 V}{\frac{1}{2}m[(V+v_1+v_2)^2 - (V+v_1)^2}$$

$$= \frac{V}{V+v_1+\frac{v_2}{2}} = \frac{V}{V+\frac{3}{4}v} \quad . \quad (3)$$

$$= \frac{V}{V+\frac{3}{2}v_1} = \frac{V}{V+\frac{3}{2}v_2} \text{ if } v_1 + v_2 = \frac{v}{2}$$

Taking now the case of the ideal air actuator absorbing 250 B.H.P. at 110 M.P.H. near the ground (where $\rho = .076$ lb. ft^3) we may make the following table:

Efficiency γ	Thrust lb.	Hypothesis (1) v ft./sec.	Hypothesis (1) D ft.	Hypothesis (2) v ft./sec.	Hypothesis (2) D ft.
60	512	215	2·18	143	4·00
70	600	139	3·18	92	5·80
80	683	80	4·70	53	9·00

Etc., etc.

The efficiency curves plotted from these values are shown in Fig. 2, from which it is inferred that for any propeller working under the best hypothetical conditions of air-flow, an increase in diameter is always accompanied by increase in the efficiency, and that in the extreme case a propeller of enormously large diameter would approximate to 100 per cent. efficiency. It is interesting to note from

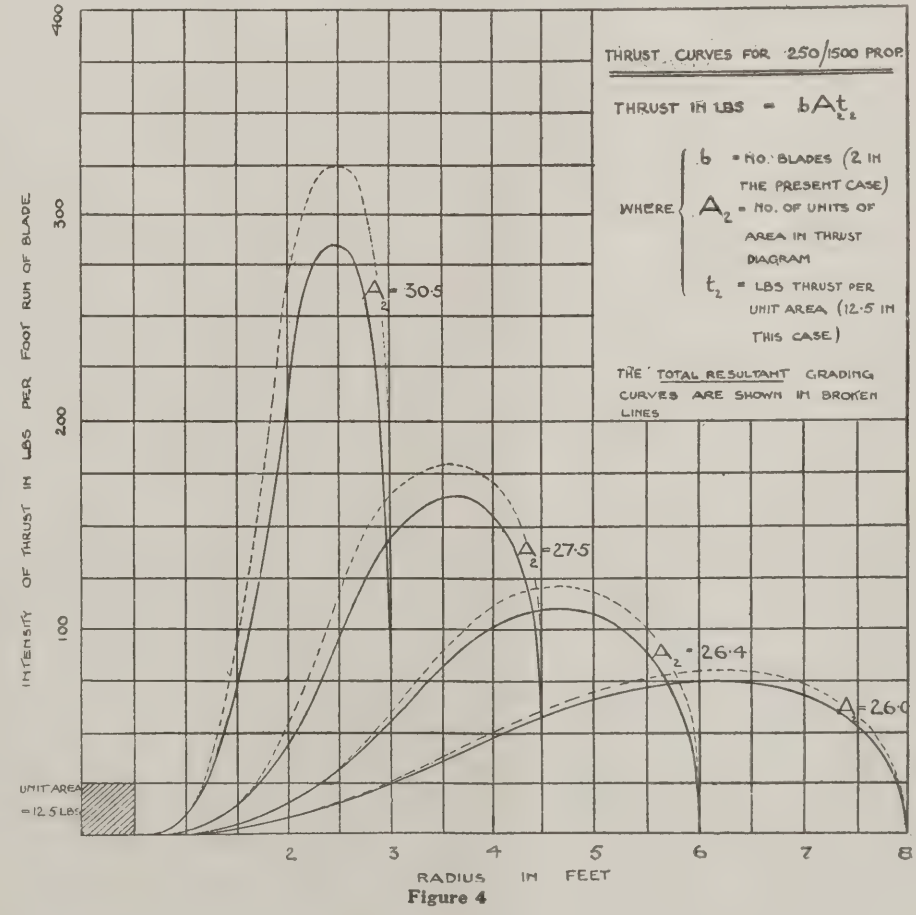


Figure 4

the curves that the efficiencies as calculated from the first expression are always much in excess of the more reliable blade element results as determined by the orthodox method outlined below, while the values obtained from the second formula are certainly more in agreement with the analytical figures over a diameter range of 7 to 9 feet, such as is likely to be employed in actual practice.

The Blade Element Method

Coming now to the well-established method of propeller analysis and design as ordinarily adopted, we are on firmer ground, the quantities involved being better known, or at least, may be experimentally determined. This method of treatment has been suspected of deficiency in that the wake stream losses are supposed to be missing. Such a charge, however, cannot be substantiated, for by applying the experimental aerofoil results to the actual blade, as made up of a large number of small elements, the whole blade reactions are necessarily incorporated and the complete story is represented in the final results. The discrepancy between such results and those obtained by the momentum method is rather to be sought in the bold assumptions and conventional methods it is necessary to adopt in any attempt to apply the Newtonian equation to the air actuator.

In Fig. 3* is shown a typical section of a propeller blade taken about half way along its length from root to tip. In seeking to apply the experimental aerofoil values to such an element it is necessary, in the first place, to find the magnitude and direction of the incoming air velocity at the moment of passing over the blades. This will evidently be obtained by compounding the axial velocity $V + v_1$ and the circumferential velocity $2\pi rn$ of the element in its plane of rotation. In terms of θ, its direction with this plane, the magnitude of this resultant velocity becomes $\frac{V + v_1}{\sin \theta}$. Having given the experimental no lift line and the Ky and $\frac{L}{D}$ curves for the section, it is now an easy matter to find the real angle of attack, α, and the appropriate lift and drag values by using the curves. Following the usual equation for an aerofoil we may write:

$$L = \frac{\rho}{g} Ky\, \omega \left(\frac{V + v_1}{\sin \theta}\right)^2 \quad . \quad . \quad . \quad . \quad (4)$$

$$R = \frac{\rho}{g} \frac{Ky\, \omega}{\cos \gamma} \left(\frac{\sin \theta}{V + v_1}\right)^2 \quad . \quad . \quad (5)$$

Since $\frac{L}{R} = \cos \gamma$ and $\gamma = \tan^{-1}\left(\frac{D}{L}\right)$

Taking now the resultant force, R, on the section it will be obvious that we are at liberty to split this up into two naturally normal components, one acting in an axial and the other in a rotational plane. The thrust component acts in the axial direc-

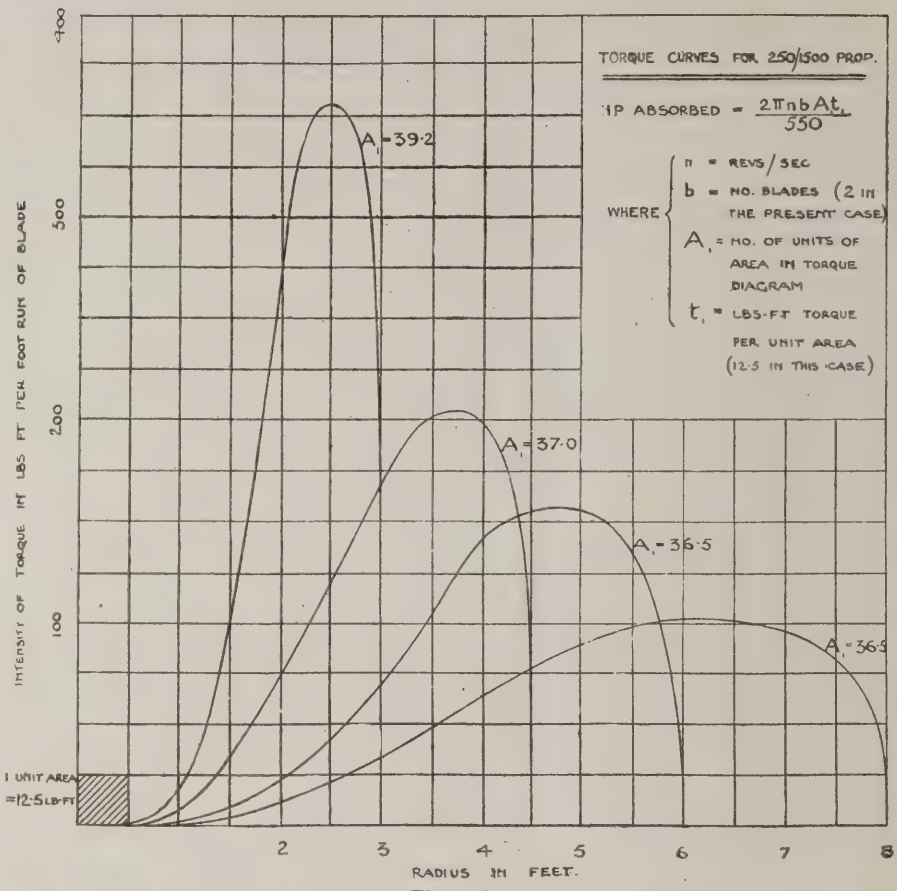


Figure 5

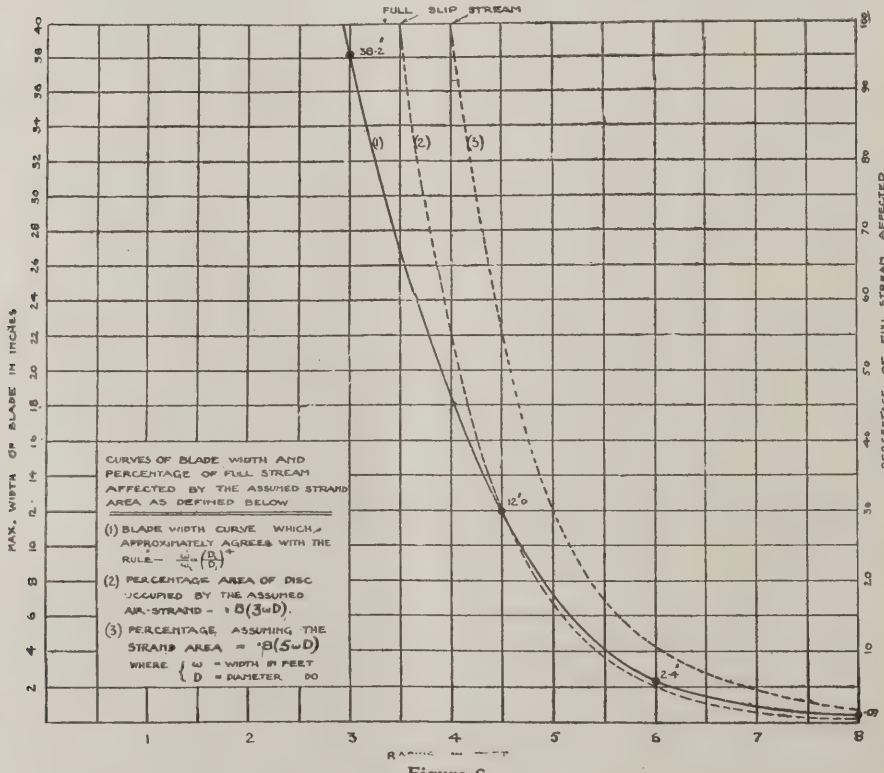


Figure 6

* The following is the notation used:
α = angle of attack between direction of relative wind and no lift line.

Ky = absolute lift coefficient.
Kx = absolute drag coefficient.
γ = gliding angle = $\tan^{-1}\left(\frac{Kx}{Ky}\right) = \tan^{-1}\left(\frac{D}{L}\right)$
L = lift intensity in pounds per foot run of section
D = drag intensity in pounds per foot run of section
R = resultant force in pounds per foot run of section
$\frac{\rho}{g}$ = ·00238 mass pounds per cubic foot for air near ground level
θ = angle between relative wind and plane of rotation = $\tan^{-1}\left(\frac{V + v_1}{2\pi rn}\right)$
θ_1 = effective helix angle = $\tan^{-1}\left(\frac{V}{2\pi rn}\right) = \tan^{-1}\left(\frac{\text{effective pitch}}{2\pi r}\right)$
n = revolutions per second
r = radius at section in feet
w = Width of blade element in feet.
V, v, v_1, v_2 as before

tion so contributing to the useful work done on the machine, while the drag component lies entirely in the rotational plane and is balanced by the engine effort. Substituting the L value from equation (4) we may write:

Elemental thrust

$$\frac{L\cos(\theta+\gamma)}{\cos\gamma} = \frac{\rho}{g}Ky\omega\left(\frac{V+v_1}{\sin\theta}\right)\frac{z\cos(\theta+\gamma)}{\cos\gamma} \quad . \quad . \quad . \quad (6)$$

Elemental drag

$$\frac{L\sin(\theta+\gamma)}{\cos\gamma} = \frac{\rho}{g}Ky\omega\left(\frac{V+v_1}{\sin\theta}\right)\frac{\cos\gamma}{z\sin(\theta+\gamma)} \quad . \quad . \quad . \quad . \quad (7)$$

We may now evaluate the efficiency η of the small blade element as a means of propulsion by taking the ratio of useful work done by the thrust-component, to the total work expended on the element. Thus the useful work is the product of thrust and velocity, while the energy expended to secure this thrust is given by the product of drag and circumferential velocity of element. We have:

$$\text{Useful work} = \frac{VL\cos(\theta+\gamma)}{\cos\gamma}$$

$$\text{Expended work} = \frac{2\pi rnL\sin(\theta+\gamma)}{\cos\gamma}$$

$$\text{Whence efficiency } \eta = \frac{V}{2\pi rn\tan(\theta+\gamma)}$$

$$= \frac{\tan\theta_1}{\tan(\theta+\gamma)} \quad . \quad . \quad . \quad (8)$$

By applying equations (6) and (7) to various sections along the blade it will be possible to obtain a series of thrust and drag intensity values which may be plotted on a curve and integrated over the whole blade. This assumes that the experimental Ky and $\frac{L}{D}$ values are obtainable for each of the sections taken, or, at least, that reliable correction factors are available which will show how these constants vary with change of camber. In the actual case it is found more convenient to plot values of torque intensity in lieu of the drag curve. A second plotting is thereby avoided, and the area of torque curve can be used directly to find the horse-power absorbed. In actual design an assumed blade width is generally taken in the first place and a multiplying constant, k, found by taking the ratio:

$$k = \frac{\text{H.P. available at engine shaft}}{\text{H.P. required under initial } \alpha \text{ and } \omega \text{ assumptions}}$$

This value of k may also be used as a multiplying factor for angles of attack while keeping the blade widths constant. This can only be done, however, when the attacking angles are small (3°—5°), the Ky curve under such conditions approximating to a straight line law. In Figs. 4 and 5 are shown the thrust and torque grading curves for the particular 250 H.P. propeller we have already instanced. The power absorbed is kept constant at all diameters by variation of blade width. The engine revolutions are fixed at 1,500 and the forward speed at 110 M.P.H. The blade widths curve under such conditions is shown in Fig. 6, the general rule for the width-diameter relation of propellers belonging to the same family and H.P. being closely followed. Thus we know:

$$n_1^3D_1^4\omega_1 \;\; a \;\; n_2^3D_2^4\omega_2$$

$$\text{or } \frac{\omega_1}{\omega_2} = \left(\frac{D_2}{D_1}\right)^4 \quad n \text{ being constant.}$$

It will be seen from the curve that very impracticable blade widths are required at small diameters, while at large diameters the widths are inconveniently small.

The aspect ratio or diameter-maximum width relation is seen to vary from about 2 in the case of a six-foot propeller to a very large figure in a propeller of sixteen feet diameter. The appropriate correction factors to use in order to bring the performance and efficiency of such propellers into line, is a matter of some difficulty, but by taking values from aerofoil tests which have seemed appropriate to the case it has been possible to recalculate the efficiency curve (7) in Fig. 2, and so arrive at the corrected curve (8), which we shall suppose is not very far from the truth. The optimum diameter in this instance is seen to be about eleven feet, but the change in efficiency over a foot or so range on either side is very small.

An Attempt to Reconcile the Two Methods

An explanation of the very considerable discrepancy between the efficiency curves for the ideal actuator and those for the ordinary air-screw is not far to seek, especially in considering the case of a large propeller, where the blade widths are small and the hypothetical assumptions obviously in serious conflict with the actual working conditions. So far from imparting a steady uniform velocity to the air dealt with, the actual wake stream will merely consist of a narrow twisted air strand, following somewhat the configuration of the coils of a rope. As a first approximation it has been assumed that the width of air-strand affected bears a constant relation to the blade width. The percentage of full disc area found by taking zones of air-disturbance three and five times the blade area is shown by the curves (2) and (3) respectively in Fig. 6. Under the first assumption the stream becomes full at a diameter of seven feet, while the wake remains completely filled up to eight feet in the latter case. The modified efficiency curves obtained by making such assumptions are shown at (3), (4), (5), and (6) in Fig. 2, from which is inferred that the convention adopted, and the assumptions made are not entirely suitable and adequate to the case.

If it were possible to take account of all the quantities involved, it would be found that there is no real discrepancy between the two methods and the efficiency, and optimum figures would be identical by whatever method arrived at.

Weather Bureau Handbook for the Use of Aeronauts

According to the annual report of the Chief of the Weather Bureau to the United States Secretary of Agriculture, a manual or handbook entitled "Meteorology and Aeronautics" is soon to be issued. This manual will appear as Report No. 13 of the National Advisory Committee for Aeronautics, of which the Chief of the Weather Bureau is a member.

The handbook, on which considerable work has been done since February, 1917, discusses the properties and general phenomena of the atmosphere which aeronauts and aviators should understand. It is divided into three parts: Part one, which deals with physical properties and dynamics of the atmosphere; part two, with topographic and climatic factors in relation to aeronautics, and part three, with current meteorology and its use. Part three also contains a summary of the free air conditions most likely to be experienced under different types of pressure distribution at the earth's surface.

Frequent conferences have been held with officials of the aeronautical branches of the Army and Navy, and plans are being perfected at several of the training camps for free-air observations in aid of aeronautics and the firing of projectiles.

Copies may be obtained on application to the National Advisory Committee for Aeronautics, Washington, D. C.

Silvex Company to Increase Output

The Silvex Company, makers of Bethlehem spark plugs, have moved to a new plant. They are installing much new machinery, including a battery of thirty Gridley Automatics.

To get these machines at this time, Mr. Schwab, president of the company, stated it was necessary to place the order a year ago.

Under normal operation the new plant will turn out 50,000 plugs each eight-hour day.

Executive Order Exempts Aeronautic Draughtsmen from Competitive Examination

During the present emergency and for a minimum length of time thereafter as may be rendered necessary by the needs of the service, the classified position of Aeronautic draughtsmen under the Navy Department may be filled upon non-competitive examination.

This order is issued upon the recommendation of the Secretary of the Navy and the Chief of the Bureau of Construction and Repair, who state that on account of the difficulty experienced in inducing qualified men to accept positions subject to the present rules and methodsof appointment, it is deemed impracticable now to fill these positions by open competitive examination.

Government Takes Plants

The United States Government took over, December 11, two of the largest manufacturing plants at Long Island City, the General Electric Vehicle Company, Borden and Starr avenues, and the Warner Speedometer Company, Jackson avenue and Honeywell street. These plants will be operated by the Federal Government.

The General Vehicle Company employs 2,000 men and has been manufacturing aeroplane motors for more than a year. The entire equipment of the plant will be employed in the manufacturing of motors.

At a cost of $1,200,000 the Warner Speedometer Company erected the new plant which has been turned over to the Government. It had been sold to a syndicate. What use the Government will make of the building, in which no machinery as yet has been installed, is not known.

Col. Montgomery of Philadelphia, a munition expert, head of the Philadelphia arsenal, will be in charge of the two plants.

Cpportunity for Aviators Rejected by American Air Service

According to a letter addressed to the Philadelphia Aero Club, Major Bridgeman, in charge of the Recruiting Office of the British Royal Flying Corps, is in a position to accept suitable young men between the ages of 18 and 30 rejected by the American Air Services. A letter from the Local Board is required certifying that the applicant is at liberty to enlist in any service that he desires. This announcement should be of interest to those who have not been able to pass the very strict requirements of the U. S. Government examinations and still desire to serve in aviation work.

REPORT OF NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

Extracts from the Annual Report of the Executive Committee

IN the latter part of March, 1917, when war with Germany seemed imminent, the committee, in conference with United States military and naval officers and manufacturers of aircraft, reviewed the condition of the aeronautic industry, the facilities then existing in this country for meeting the requirements of the Government, the possibilities of adequate expansion, and the then patent situation and its influence on the aeronautic industry.

A sub-committee was appointed to co-operate with representatives of aircraft manufacturers and to investigate all problems entering into the quantity production of aircraft for the Government. After a careful study of the conditions then existing the Advisory Committee submitted recommendations to the War and Navy Departments for increasing the quantity production of aircraft and urging the adoption of a continuing program of manufacture for the next three years.

In early April the Chairman of the Executive Committee conferred with the Secretary of the Navy and the Secretary of War as to the best method to obtain the most efficient results in the development of aviation and the supply of aircraft for military and naval purposes, stating that the Advisory Committee deemed it desirable to create an aeronautical service with a civilian head, but not a distinct Government department. This met the informal approval of the two secretaries and after a thorough study of the problem and in the light of the history of the air services of England and France since the beginning of the war in Europe, the committee recommended to the Council of National Defense that a board be appointed by the Council of National Defense, with the approval of the Secretary of War and the Secretary of the Navy, to be known as the Aircraft Production Board, whose duties would be to consider and deal with the problems arising in connection with the quantity production of aircraft in the United States for military purposes. The Advisory Committee further recommended that the Secretary of War and the Secretary of the Navy appoint a Joint Technical Board of the Army and Navy for determining specifications and methods of inspection for all aircraft requirements for the two services.

Ground Schools for Aviators

Supplementing the recommendation made to the Secretary of War and to the Secretary of the Navy that a continuing program be approved for the production of aircraft, on April 13th the committee recommended to the Council of National Defense that the several problems connected with the establishing of cadet training schools for aviators and with the production of aircraft should be considered together as interrelated problems and should also be considered jointly for the uses both of the Army and Navy.

The committee, further, at the suggestion of and in co-operation with the War Department, took the initiative in organizing the several ground or cadet schools for the preliminary training of aviators in this country and in determining the curriculum and methods of carrying on this instruction.

To this end the committee took under consideration the different methods of training used by Great Britain and France. A special commission was sent to Canada to study the methods of training used at the Camp Borden Military School of Aeronautics at Toronto. The committee called the conference representatives of the War Department and of six established engineering schools in the United States in connection with the organization of this work.

On recommendation of the committee, the War Department selected the following six colleges for the establishment of ground school training in aeronautics: Massachusetts Institute of Technology, Cornell University, Ohio State University, Illinois University, University of Texas, and University of California. Later, Princeton University and Georgia School of Technology were added. After the desired organization and program of training had gained preliminary form, the work of further development and routine supervision was taken over by the War Department.

Aeronautic Patents

In January, 1917, the War and Navy Departments called the attention of the Advisory Committee to the prohibitive prices of airoraft charged by the various aircraft manufacturers, attributing these prices to the extra item of royalty added by each firm in anticipation of infringement suits by owners of alleged basic aeronautic patents who were then threatening all other airplane and seaplane manufacturers with such suits, and causing thereby a general demoralization of the entire industry. After numerous meetings with Government officials, owners of patents and aircraft manufacturers, extending over a period of several months, the committee recommended the organization of an association among aircraft manufacturers for the purpose of cross licensing aeronautic patents between the members, such association to be known as the Manufacturers' Aircraft Association. The committee co-operated also actively in the determination of the general terms and conditions of this agreement, and in securing its adoption by the leading aircraft manufacturers of the country. The question of the legality of this association under the Anti-trust Statutes of the United States having been raised by certain members of the Aeronautical Society of America, the matter was submitted by the Secretary of War to the Attorney General of the United States for his opinion. Under date of October 6, 1917, the Attorney General rendered an opinion "that the Association, Inc., as now constituted, and the cross-license agreement under which it is now operated, are not in contravention of the anti-trust laws of the United States."

The purposes in view in the formation of this association, and which it is believed have been achieved, are the folowing:

(1) The prevention of the virtual deadlock with danger of monopoly existing under the patent situation as obtaining previous to its consummation, and the removal of restraint upon the trade operative under the existence of such situation.

(2) The settling or avoiding of all litigation, actual and prospective, under the previously existing patent situation.

(3) The opening of the industry to free competition of all airplane manufacturers and the opening of all patents held by the membership of the association to equal use and on equal terms.

(4) Provision, as set forth in the articles of agreement, whereby a design originating with a given manufacturer may be put into production and used by another manufacturer with all design data, drawings, specifications, etc., on the payment of a small fee, thus facilitating quantity production of an approved design and stimulating the production of new designs or processes.

(5) The development of financial stability and confidence in the airplane industry, thus making possible the financing of the absolutely needed expansion in order to take care of the expected demands.

(6) Reduced cost of aircraft to the Government by reduction of airplane royalties payable under all patents made available under the association to an amount less than one-half the figures previously demanded under a part only of these patents.

(7) Broadly speaking, the encouragement of airplane production to the highest practicable degree and with reference to the demands of the Government under war conditions.

Information From Europe

In March, 1917, the committee arranged, in conjunction with the National Research Council, for representation on the foreign committee sent abroad by the National Research Council to obtain detailed information on scientific matters of importance in connection with the war, and Dr. Joseph S. Ames, member of this committee, was appointed such representative.

Associate Members

In order to further develop contact with sources of information from abroad, Lieut. Col. L. W. H. Rees, R. F. C., member of the British Commission, together with Maj. Joseph Tulasne, Capt. de Guiche and Capt. A. de La Grange, of the French Flying Corps and members of the French Commission, were made associate members of the committee, and as such attended its meetings, contributing valuable information and suggestions regarding matters with which they were especially familiar.

Sample Forms of Aeroplanes from Europe

In connection with the bringing of sample forms of aeroplanes from Europe for use in developing new designs in the United States, the committee co-operated with the War Department in the search for a site and in arranging for the construction of a suitable building.

Census of Production Capacity for Aircraft and Aeronautic Engines

Previous to the entrance of the United States into the present war, the committee had undertaken a census of the production facilities of manufacturers of aircraft and aeronautic engines, which information was made available for use of the Aircraft Production Board at the beginning of its work in April.

Site for Experimental Laboratory

In October, 1916, the committee took under consideration the question of the selection of a suitable site for the committee's proposed experimental laboratory. In this study the committee acted in co-operationwith a board of officers of the U. S. Army which had been appointed to inspect sites for the experimental station and proving ground of the War Department.

At the suggestion of the War Department requesting recommendation by the Advisory Committee in the matter, this committee inspected several proposed sites and after making inquiries as to the general health conditions and the problems of accessibility to Washington and the larger industrial centers of the East, protection from enemy naval attack, climatic conditions, and cost of the site, it made recommendation to the War Department for the purchase of a site about four miles north of Hampton, Va., which recommendation was accepted by the War Department and the site was purchased.

On this field the War Department has allotted to the committee a space suited to the erection of the committee's proposed research laboratories. The committee has designed the first building of the group contemplated, and the design has been approved by the architects for the War Department. Contract has been entered into with the J. G. White Engineering Corporation, New York City, for the erection of the laboratory at an estimated cost of $80,900. The laboratory building is now in the course of construction. At this laboratory the committee will carry on, in wide variety, research and investigation relating to aeronautic science and including a study of planes in free flight. The committee has also under preparation plans for the first aerodynamic laboratory to be installed at Langley Field intended for the development of high wind speeds. The work on this laboratory will be begun as soon as plans are ready.

Insurance for Aviators

In the early part of the year 1917 the committee took up the question of insurance for aviators and after correspondence with various life and accident insurance companies in the United States it suggested to Congress, the War, Treasury and Navy Departments, the advisability of undertaking at an early date the insurance of aviators or some form of financial co-operation with the insurance companies that would enable them to write insurance at rates possible to the insured.

Aeroplane Design — Aeroplane Materials — Steel for Aeroplane Construction

The Committee has co-operated with the Aircraft Production Board in connection with a wide variety of problems relating to the design specifications, and tests of aircraft. The Committee has now in hand (Nov., 1917) a most important investigation on the use of steel for aeroplane construction and is supervising the development of a design for construction in steel, to be later subject to a program of tests intended to show the possibilities of such type of construction.

In connection with the subject of the materials for aeroplane construction, the Committee has given its attention chiefly to the investigation of strut forms for aeroplanes, the strength of spruce spars, and the development of cotton aeroplane fabrics as a substitute for Irish linen.

In the field of power plant design and construction for aircraft, the Committee has co-operated with the Bureau of Standards in the design, construction, equipment and operation of a large vacuum chamber engine testing laboratory which is intended to reproduce the conditions of aeronautic engines operating at high altitudes. This equipment has been installed with special reference to the development and improvement of the "Liberty" engine and important investigations bearing on this problem are now being carried forward. The Committee has also carried on a number of researches on the subject of radiator design and proportion, carburetor design and adjustment, ignition apparatus, and is continuing its study of the problem of an aeroplane engine muffler.

Tests on Liberty Engine

At the request of the War Department, the Committee loaned one of the members of its technical staff for the supervision of tests on the first Liberty Engines at Detroit, Pikes

(*Continued on page 663*)

FOREIGN NEWS

FRANCE

A special dispatch to the New York *Globe* states that the Allied Conference, which sat in Paris, had appointed an air committee, sittings of which are to continue for another week. The policy of extension of bombardments and combatting increased German output and effort in aviation, the dispatch continues, are among the questions receiving consideration by the committee.

On Dec. 13 a summary of French aerial activity for the three days previous was issued as follows:

"From Dec. 10 to 13 nine German aeroplanes were brought down by our pilots. In the same period our aviators carried out various effective bombing operations, in which projectiles weighing 10,000 kilograms (22,000 pounds) were thrown down, especially on the aviation grounds at Colmar and Schlesmaldt, warehouses at Logelbach, factories at Rombach, in the region of Waville and at Chambley and Thiaucourt, and on railway stations at Warmeriville, Juniville and Amagne-Lucquy. Good results were observed."

The text of the official statement for Dec. 16 contains the following paragraph on aviation:

"Our chaser aeroplanes displayed great activity on the day of Dec. 15, bringing down five enemy machines. It has been confirmed that three other German aeroplanes were smashed on the ground as the result of engagements which took place on Dec. 12 and Dec. 14."

Leo Benoit, an aviator of Attleboro, Mass., fell with his machine on Thursday while making a flight over the grounds at a French aviation school. Both Benoit's legs were broken. He was taken to a hospital, where he is reported to be resting comfortably.

Charles J. Biddle, of Andalusia, Pa., and Phelps Collins, of Detroit, Mich., both members of the Lafayette Flying Squadron, have each brought down a German machine within the last week.

American railway engineers working behind the British front have been killed by aerial bombs dropped by the Germans. The number lost has not yet been announced.

Among the trophies being displayed to assist the sale of bonds for the National Loan is the gondola of one of the recently captured Zeppelins which has been placed in the great court of the Invalides. A tank armed for battle and one of Guynemer's planes are also on view.

An explanation for the loss of the German Zeppelins after their raid on England some time ago is contained in an account from one of the participants in the fight with the monsters over France. The attack was conducted at such a great altitude that it was impossible to observe objectives when flying at full speed. The engines on the Zeppelins were, therefore, shut down and it was found impossible to restart them again. The strong south wind blew them over France, and it was necessary to descend to a lower altitude before the motors could be re-started.

GERMANY

An official statement was issued on Dec. 12, summarizing the work of the German aviation section for the month of November. The Germans claim to have destroyed 22 captive balloons and 205 aeroplanes belonging to the Allies, and they place their losses at only two captive balloons and sixty aeroplanes. It is not unusual for the Germans to claim that the Allied loss is several times their own, but their lists of losses only include aircraft lost "in battle."

An Associated Press cable gives the figures for the strength of the German air forces from a "reliable source."

There are now more than 250 aero squadrons, totalling 2,500 machines, of which 23 are bombarding squadrillas, 40 chaser, 30 protection squadrillas, 80 patrol squadrillas, 100 artillery squadrillas; total, 273.

These figures do not include naval aircraft.

A *Times* dispatch summarizes the fate of 45 Zeppelins as follows:

"Destroyed in Germany, 5; destroyed in neutral countries near the front, 5; destroyed in England by the British or on their way home from England, 15; others destroyed at sea, 2; out of use, 5; in use as training schools, 4; in use chiefly in the North Sea, 9; total, 45."

A report issued by the Wolff Telegraph Bureau of Berlin denies that any aviators attached to the American Expeditionary Forces participated in the recent raid over Esch, Luxemburg. The airman may possibly have been an American in the British or French service.

A dispatch from Zurich says that an explosion occurred in the Zeppelin works at Friedrichshafen which did considerable damage, and resulted in many dead and injured.

Another explosion is reported in Kiel which destroyed a factory where bombs are made for Zeppelins and aeroplanes.

Lieutenant Erwin Boelime, one of the most successful German aviators, and successor to Captain Boelke in command of the latter's squadron, has been killed on the western front. His death occurred the day before the German Emperor awarded him the Order of Pour la Mérite.

GREAT BRITAIN

A special Aviation report was issued on Dec. 12 as follows:

"During Monday night naval aircraft carried out a bombing raid upon the Oestacker airdrome and the Bruges docks. Many tons of bombs were dropped upon both objectives. On the former, owing to poor visibility, the results were difficult to observe, but at the latter a good showing was made and a fire started. All the machines returned safely.

"The weather became suitable for flying on Monday and great activity in the air took place on both sides. The enemy's machines were particularly active west of Cambrai, making repeated attacks on our artillery machines. Our aeroplanes dropped many bombs and fired many rounds from their machine guns on enemy villages, hutments and trenches. In the evening hostile machines dropped bombs in our army areas, but only slight damage resulted.

"During the day two German aeroplanes were brought down in air fighting and two others were driven out of control. A hostile balloon also was brought down and another German aeroplane was shot down by our infantry. Three of our machines are missing.

"At 11 o'clock Tuesday morning our machines left their airdromes in fine weather to bomb certain factories in Germany. On reaching the area of their objectives the pilots found their targets obscured by clouds, but seeing a clear gap further northeast they continued the flight in that direction. Through a gap in the clouds they recognized a large railway junction northeast of Pirmasens and dropped their bombs upon it. The closing of the gap in the clouds prevented observation of results. Although the whole sky was covered by low clouds during the return journey, all our pilots succeeded in reaching their airdromes safely."

On December 17th a report on aviation was issued, as follows:

"Although the weather was fine Saturday, a very high wind and ground mist interfered with reconnoisance and artillery work. Many rounds were fired during the day in enemy trenches, and bombs were dropped on numerous targets, including two positions of long range guns southwest of Lille. Later we again bombed these gun positions.

"During several flights three hostile machines were brought down and two were driven out of control. None of ours is missing."

An official announcement regarding the campaign in Palestine reports aerial activity:

"Our aeroplanes dropped fifty-six bombs on motor boats and sheds and on troops at the mouth of the Jordan, with good effect, obtaining twenty-four hits."

"On Tuesday night a bombing raid was made by naval aircraft on the Bruges docks," says an Admiralty announcement Dec. 13. "The visibility was bad, with lowlying clouds. One of our machines is missing.

"The usual patrols were carried out. One enemy aircraft, driven down out of control, was observed to crash to the earth."

An official Admiralty announcement issued on Dec. 15 reports the following losses:

"A British airship of the non-rigid type, with a crew which proceeded on patrol Tuesday from an east coast base, has not returned, and from the information available it is believed she has been destroyed by a hostile seaplane in the southern part of the North Sea.

"A second airship of similar type was forced to descend in Holland through engine failure, on Wednesday."

Further details regarding the London to Constantinople flight, a distance of 2,000 miles, have been made public. The remarkable flight was negotiated by a twin tractor Handley Page biplane, with two 250 horsepower Rolls-Royce motors. In addition to the pilot, three officers, an engineer and two mechanics were carried—a total of seven passengers. Beds, beddings, two boxes containing spare parts and tools, equivalent to another engine, as well as ammunition and bombs were carried, making a load of six tons.

An order signed by General von Ludendorff, dated June, which has fallen into British hands, says that the Allies are employing their aeroplanes economically with a view to the great battles of the future.

"We should be wrong (it adds) to overwork and wear out our air formations, which are inferior in numbers, by sending them out several times every day. Consequently the infantry and artillery must be told that it is impossible to prevent the enemy's planes from flying over our lines, and they must not get nervous when they see them overhead. Airmen are to be used sparingly in calm times in order that Germany may have as many of them as possible for great emergencies."

In order to save gasoline for military and aviation purposes, heavy fines are imposed for using motor cars on unnecessary journeys. A fine of $250 was recently imposed on Sir Maurice, surgeon to the household of the Princess Royal for taking a 140-mile automobile journey out of London.

A large dugout for protection against air raids has recently been opened in London, which is sufficiently large to afford protection for 20,000 people. It is an unfinished railway tunnel, work on which was discontinued before the war, and is equipped with electrical lights and seats.

HOLLAND

In order to protect the Dutch frontier towns from damage on account of aeroplane raids, Dutch flags are being flown from the church steeples. There is no protection, however, against night raids. The Dutch War Minister recently stated that foreign governments have not refused to pay compensation for damage done by their airmen.

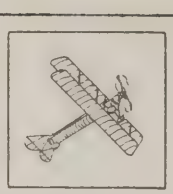
ITALY

The official statement for Dec. 10 states that a French airman brought down an enemy machine.

The statement for Dec. 12 announced that two enemy aeroplanes were downed by British aviators operating on the Italian front.

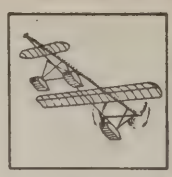
The Italian War Office announced on December 17th that:

"On the night of the 14th and 15th movements of troops within the enemy's lines of communication were bombarded effectively by our airships. A hostile aeroplane was brought down by British airmen near Ormelle, and one of our airmen accounted for another machine west of the Saren Valley."



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

A Model for Winter Flying

(*Continued from page* 614)

From the six-inch piece of bronze tubing file off two one-inch pieces and clamp one between the extreme ends of the bamboo strips and the other between the opposite extreme ends. Both should be securely fastened so as to be able to withstand the strain of the tightly wound rubber strands. To brace the frame cut off a strip of bamboo five and one-half inches about three-sixteenths in diameter and fasten it across the frame between the point and rear.

In cutting the propellers, the following plan might be adopted to safeguard against cutting both alike, as both must travel in opposite directions: Lay both blanks on the board with the round edges facing each other at one end and the straight edges facing each other at the opposite ends. At the ends where the round edges are facing each other start to whittle, applying the knife to the straight edges, do not touch the round edges. Next apply the knife to the straight edges which face each other at the opposite end and likewise do not touch the round edge. Now turn the blanks over and the position of the blanks will be reversed. This time apply the knife to the round edges of the blanks and when this has been done just continue to whittle until half a blade has been cut, then turn the blank back again and whittle along the straight edge, which has been cut, until the blade is finished.

The next step should be toward the completion of the wings and the quickest method to this end is to assemble all the necessary material for the wing construction where it can be picked up when needed. Sandpaper the two sticks for the entering and trailing edges of the main wing, then cut off nine inches on both, leaving both to measure twenty inches, one measuring one-eighth by one-quarter inch and the other one-quarter by three-thirty-seconds, then from the one-eighth by one-sixteenth inch strips of bamboo cut five four-inch strips for ribs and after curving each to the depth of about one-quarter inch, the deepest part of which is toward one end of the rib, attach the end with the deepest section of the curve to the entering edge of the wing, each rib to be attached at a distance of four and one-eight inches apart. The rear end of the ribs should now be attached to the trailing edge. In order to prevent the end ribs from buckling which is likely to happen when the silk is drawn on the frame, an eight-inch strip of bamboo one-eighth by one-eighth inch in thickness should be securely fastened to the under part of the three end ribs of the frame at a distance of one inch and a half from the entering edge.

In covering the frame with white china silk it is essential that it is drawn taut to prevent friction and add to the appearance of the machine. To do this allow about one inch of silk on all four sides of the frame, so as to insure plenty of space for tacking the silk to the frame by the use of pins. Be sure that the silk is tacked on securely and then sew it very close to the entering edge and one end of the frame after which remove the pins from along these edges and at the same time retack the silk to the other edges to insure its being taut. When this has been done remove the pins and clip off the surplus silk that hangs from the under side of the frame and lay the wing aside until the forward wing is completed.

In making the forward wing likewise assemble all the necessary material and for streamline effect sandpaper both the tendering and trailing edge stick. These sticks measure nine inches in length. Only four ribs are needed for the forward wing and these should measure three inches in length, the curve or camber being obtained by the same method as that applied to the ribs for the main wing.

(*To be continued*)

Attention Model Readers.

It was but a short time ago when we sought the sincere co-operation of each and every model flyer in this country to make the model exhibition in connection with the proposed Pan-American Aeronautic Show one of the greatest ever held in this country. Unfortunately through circumstances outlined on the editorial pages of this issue the show has been postponed and the model builders will have to forego the opportunity of demonstrating their ability. It is indeed to be regretted that such is the case for the time is opportune for the display of model aeroplanes such as have been described in AERIAL AGE from time to time and which would prove beneficial to many young model builders anxious to increase their knowledge along these lines. However, conditions today are such that one is likely to meet with disappointment at any time and we are sure our model friends will be willing to bear this disappointment with us. To those who have thus far expressed their intention of co-operating with us in this work we extend our heartiest thanks.



Another convincing demonstration of the usefulness of the model aeroplane. This model is valued at $2,000, and is exact in every detail. The model is the property of the Canadian Aeroplanes, Ltd., Canada, and is mounted on the hood of Mr. F. G. Ericson's automobile. No doubt Mr. Ericson, who is the chief engineer of the above company, realized the interest drawing quality of the model, and prepared it for use in connection with the recent Victory Loan Campaign for the Canadian Government



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

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PRINCIPAL CHARACTERS.

Banana Spanners: A charming girl, hitherto known as Diana Manners. She has dark hair and a ditto past.

Lt. Regd. Splash: A daring aviator, the only person who has ever looped the loop on a Strafemall Tripelane.

Lady Sniff-Hear Denning: Better known as "Dear Cynthia." A Society butterfly of lurid colors.

Lt. Neville Raynor: Another also-ran for Banana Spanners' hand.

WHEN the number of men entered carrying on a shutter (a litter—Ed.), the corpses of Mr. Rivers and his bride, the authoress, had not seen that famous play, "The Face at the Window."

Since writing the last instalment a visit to this play has seriously convinced her that "Dando's Corpse Reviver" is not the only thing for bringing the dead to life (reading aloud "The Joy-Stick" is another certain cure—Ed.). Consequently it must be assumed that Mr. Rivers and his ber-lushing bride are again with us—ready to do all the dirty work at the crossroads demanded by the readers of the Charles Garvice—Ethel M. Dell type of literature.

With this brief preface let us get to grips with the vitals of the story, as the Editor has only secured the rights of this new version on condition that I murder two of the characters in every instalment.

* * *

Lieut. Splash entered the breakfast room with the silent catlike tread of a melodrama hero. "Ah! my beautiful Banana!" he said, looking with soulful eyes at Lady Spanners, "it is you I have come to seek." Really, he was a bit of a l——, but love covereth a multitude of sins.

To be candid, it was his breakfast he had come down for, but hang it all, you can't tell your lady-love that when you bump into her so unexpectedly.

"Speak to me not, Lieut. Splash, for I know your cowardly secret; I know you took the name-plate of the Avago Biplane and tried to pass it on the A.I.D. as a piece of cheese. Therefore, begone. Once I loved you, but now, now I want never to see your face again. Therefore, for my sake, do not wash it." With a look of black rage on his face, Lieut. Splash sprang from his chair, knocking over with one elbow the plate of egg and bacon at his side, his other hand absentmindedly being in the waiter's pocket. "Woman, you shall never live to tell that tale," and, with a last despairing glance round the room, he pulled out a huge revolver (Broncho Billy, 1914 pattern, price 12s. 6d.), pointed it at her, and-yes-fired! Ah! gentle reader, you expect the heroine to drop a quivering blancmonge-like-mass on to the floor. But you are wrong. This is no ordinary serial story. For at that moment, in at the door sprang a griselled and war-worn man. He was directly in the line of fire, and he, not our dear Banana, received the full explosion in the middle of his waistcoat, falling headlong to the floor, and at the same time pointing a warning finger at Lieut. Splash. His lips uttered a last phrase: "Have you filled in Form CXT. 21335 W17, Vic. Cap II?"

P. S.—Applications are invited for the post of Assistant-Director of the Standardization of Theatre Chocolate Boxes, for it was he who paid the penalty for the hasty temper of our late hero. Thus in this cheerful manner is killed off the first character in our story. (But this character is not in the story, and please find some newer methods of sudden death for your victims.—Ed.)

Bullet-proof helmets and gas masks served out to all readers on request. Chloroform always to hand on application.

—*From The Joy Stick.*



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—Courtesy of Life.

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(*Continued from page* 658)

Peak, and elsewhere, to determine their mechanical and thermal efficiency and the power delivery of the engines at various altitudes.

Aeroplane Instruments

The Committee has undertaken important investigations relating to the development of various instruments used in the navigation of aircraft and in testing aircraft in free flight. In particular there has been developed an improved form of geographic position indicator which will be of special value in connection with certain free flight tests under consideration

Aircraft Communications

Regarding the subject of aircraft communications, the Committee has co-operated in the development of a generator for wireless sending from aeroplanes and intended to satisfy the requirements of the Army and Navy. Means for receiving wireless signals in an aeroplane have also been investigated and it has been established that a very efficient receiving set employing the sound method is practicable; investigations are still being carried on regarding means for detecting hostile aeroplanes before they are visible or before they can be heard by the unaided ear.

Mapping from Aeroplanes

On March 8, 1917, the Committee took under consideration the development of methods for mapping from aeroplanes which should be rapid, economical and sufficiently accurate for aviation purposes. Allotments were made for developing a new type of aeroplane mapping camera and gratifying progress has been made in the development of such an instrument. Before regular navigation of the air can be undertaken it will be necessary to supply maps and to establish and suitably mark aerial routes and suitable landing places for the aviator. In certain sections of the country and through the generous co-operation of patriotic citizens interested in this work, gratifying progress has been made in these directions, notably between Dayton, Ohio, and Rantoul, Illinois.

Meteorology

In the field of meteorology, the Committee recommended to the President an appropriation for the extension of the aerological work of the U. S. Weather Bureau, and in accordance with which an appropriation of $100,000 was made by Congress for this work with special reference to the securing of more comprehensive observations on the air in aid of aviation. The Committee also acted in co-operation with the U. S. Weather Bureau in placing meteorological exhibits at the First Pan-American Aeronautic Exposition.

In August, 1917, the Advisory Committee recommended that there be organized under the Chief Signal Officer of the Army, as a war measure, a military aerological service with necessary stations and equipment, both in the United States and abroad, and that this service be organized in full co-operation with the Weather Bureau and with care to avoid duplication.

A special report on Meteorology and Aeronautics has also been prepared and issued as Technical Report No. 13.

Board of War Inventions in Aeronautics

Soon after the declaration of hostilities with Germany, the Chief Signal Officer called to the attention of the Committee the large amount of material which was coming before the War Department comprising inventions and suggestions relating to aeronautics in warfare, and asked assistance in examining and disposing of such material. Accordingly, this Committee, through an appropriate subcommittee appointed for the purpose, has acted as a board of inventions for the Government in matters relating to aeronautics, and since the outbreak of hostilities between the United States and Germany it has weekly examined hundreds of suggestions and inventions pertaining to this subject and referred to it by the War and Navy Departments in addition to the suggestions and inventions which come direct to the Committee. This work has required a large amount of time and careful study and has called for considerable increase in the technical and clerical staff of the Committee in order to care for the very large amount of examinations, study, and correspondence with inventors regarding these matters. Several suggestions of value have been received and brought promptly to the attention of the particular Government office most directly interested.

Definition of Technical Terms

During the year the Committee has given further attention to the subject of the definition and standardization of technical terms used in aeronautics, and has prepared a further edition of its bulletin on the subject. (Technical Report No. 15.)

Metric System for Drawings and Calculation

On recommendation of the Advisory Committee, in December, 1916, the War, Treasury, Interior and Commerce Departments adopted the Metric System of weights and measures for all drawings and calculations on aeronautical matters, for use with the accompanying English equivalents.

Aerial Mail Routes

In December, 1916, the subject of co-operation with the Post Office Department in the establishment of aerial mail routes was considered, and the same matter in one form or another has been considered from time to time since that date. Recently the Second Assistant Postmaster General has expressed a desire to develop such routes in a trial way and so far as military requirements may permit furnishing the needed equipment and personnel. The Committee is prepared to advise with and aid the Post Office Department in the furtherance of these aims.

Civil Aerial Transport

In the latter part of 1917 the general subject of civil aerial transport was brought to the attention of the Committee and a special subcommittee was appointed to take under consideration the various phases of civil and commercial uses of aeronautics with special reference to the conditions which may be expected to develop at the close of the war.

Landing Field for Transient Aviators

In connection with the accommodation of transient aviators, and in co-operation with the War Department, a tentative selection of a tract of land was made on the Eastern Branch and southeast of the Washington Navy Yard.

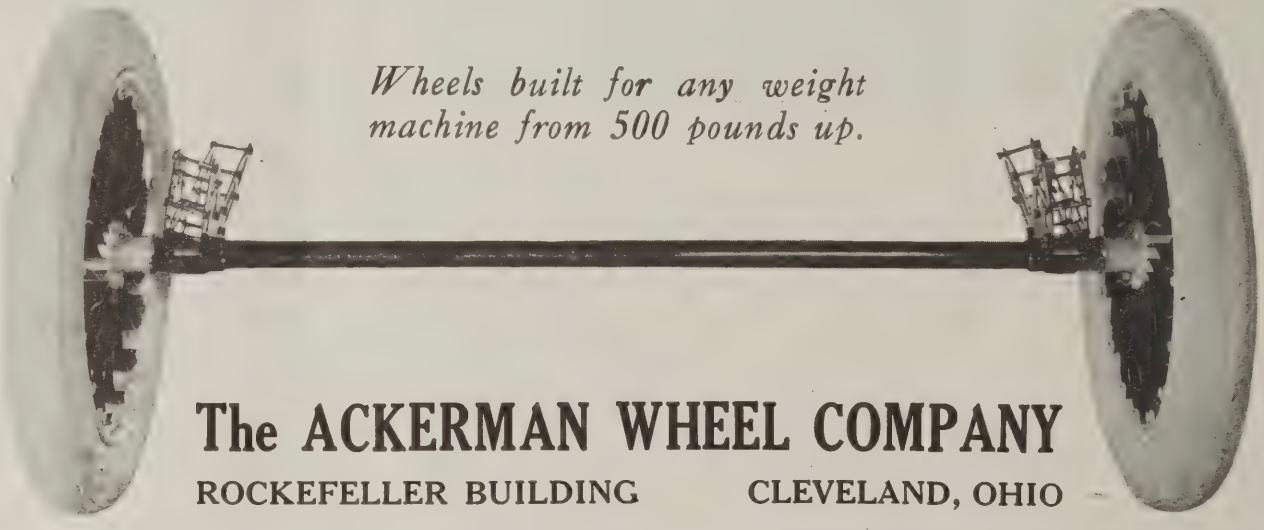
Inspection Trip

In the early part of November, 1917, the officers of the Advisory Committee made a trip of inspection to the three principal centers of aeroplane production, namely, Dayton, Ohio; Detroit, Michigan; and Buffalo, New York.

The purpose of this trip was to place the Committee in immediate contact with the conditions in the industrial field and give them an opportunity of forming a personal, first-hand judgment regarding the productive capacity for aeroplanes and for aeronautic engines as provided by the facilities developed at that date and as contemplated in plans for further development.

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"It contains 260 excellent illustrations, which in themselves alone make the book valuable and which force upon the reader the realization of what has already been accomplished and what is yet to be accomplished by this country. There are innumerable books on aeronautics, practically all of which are incomprehensible to the layman, and none that cover naval aeronautics so thoroughly. This is the first book that has come to our notice which is so written that it is of value and most interesting to the novice as well as to the expert airman. Facts are told in a clear, concise, readable way, without undue use of technical terms, and yet certain chapters are sufficiently technical for the expert.

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"Of interest to everyone are the chapters discussing aeroplane guns and aerial gunnery, night flying, instruments for aerial navigation, United States Navy Aeronautics, Naval Militia Aeronautics, Aerial Coast Patrol, evolution of the seaplane and the flying boat, naval dirigibles, and other subjects."

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(*Continued from page 651*)

Mill Specifications for Aircraft Douglas Fir

REGION.—1. All Douglas fir timber used in the production of this material shall have grown in the north Pacific coast timber region of western Oregon and Washington and near-by regions of British Columbia.

TIMBER.—2. The trees used in the production of this lumber shall be preferably of the "young yellow fir" type and shall be in a healthy condition at the time of felling. Brashy lumber characteristic of old, overmature, or decadent yellow fir trees will not be accepted.

LOGS.—3. The logs from which the material is produced shall be preferably "butt" logs, and in no case shall "top" logs be used.

GRAIN.—4. All grain shall be straight; that is, the angle of deviation from a line parallel with the edges shall not exceed 1 in 30 (1:30) on surfaces with diagonal grain and 1 in 20 (1:20) with spiral grain. Stock 4 inches and thicker may be flat grain and stock less than 4 inches thick shall be vertical grain.

TEXTURE.—5. (*a*) The wood shall be strong, tough, and elastic. Brashy pieces will not be accepted.

(*b*) The rate of growth of any piece shall not be less than 30 annual rings to each 3 inches (76.2 mm.) when measured in a radial direction on either end section through the zone of maximum growth. Furthermore, no single inch (25.4 mm.) shall have less than 8 annual growth rings.

KNOTS AND BURLS.—6. (*a*) Not less than 90 per cent of the total footage of each shipment shall be free from knots of all kinds, and from burly, curly, gnarly, and irregular grain, on all four sides of each piece.

(*b*) In the pieces comprising the balance of the shipment (10 per cent or less) knots and burls or similar irregularities of grain and other defects will be allowed, provided that the buyer is able to obtain cuttings from each piece which are clear, sound, straight-grained, and not less than 5 inches (127 mm.) wide and 16 feet (4.88 m.) long. Not more than 25 per cent of the total volume of each piece shall be discarded in sawing out cuttings.

PITCH POCKETS.—7. (*a*) One pitch seam or pocket not to exceed 2 inches (50.8 mm.) long or its equivalent in minor pockets (provided they are not in the same annual ring) will be allowed in either or both faces of each piece 16 to 31 feet (4.88 to 9.45 m.) long and two such pockets or their equivalent in either or both faces of each piece 32 to 40 feet (9.75 to 12.19 m.) long. Pieces shorter than 16 feet (4.88 m.) and pieces narrower than 6 inches (152.4 mm.) shall be free from pitch pockets.

(*b*) Pieces having pitch pockets too large or too numerous to be allowed as defined in paragraph 7 (*a*) will be inspected in the same manner as for knots and burls as specified in paragraph 6 (*b*).

SAP.—8. Bright sap will be allowed in any piece provided it does not extend more than one-fourth the width of the piece or one-third its length.

ROT AND SHAKE.—9. All pieces shall be free from rot, shake, dote, red heart, purple heart, and all other forms of decay.

TOOL MARKS AND OTHER DEFECTS.—10. Pieces must be free from picaroon holes, hook marks, and other defects caused by handling-tools, and equipment.

WANE.—11. Wane will be allowed on occasional pieces, but in no case shall it exceed either one-fourth the thickness, one-eighth the width, or one-sixth the length of the piece.

DIMENSIONS.—12. Percentages of various thicknesses, widths, and lengths, and the respective percentages of flat and vertical grain stock to be supplied are subject to special arrangement between purchaser and contractor at the time prices are fixed.

TOLERANCES.—13. (*a*) Thickness may be scant not to exceed one-eighth inch (3.18 mm.) on occasional pieces. If more than one-eighth inch (3.18 mm.) scant they will be accepted at contractor's option and tallied in the next inch class below.

(*b*) Widths may be scant not to exceed one-fourth inch (6.35 mm.) on occasional pieces. If scant more than one-fourth inch (6.35 mm.) they will be accepted at contractor's option and tallied in the next inch class below.

(*c*) Lengths may be scant not to exceed 2 inches (50.8 mm.) on occasional pieces. If scant more than 2 inches (50.8 mm.) they will be accepted at contractor's option and tallied in the next 1-foot class below.

LOADING.—14. Shipment is to be loaded and covered in the manner prescribed by the purchaser.

THE AUSTRIAN LOHNER FLYING BOAT

(*Continued from page 649*)

Chord, upper plane.....2.70 meters
Chord, lower plane.....2.20 meters
Hull, maximum length.....12.50 meters
Bomb carrying capacity.....400 Kg.
Motor, Austro-Daimler.....300 H.P.

In form the ailerons are trapezoidal, like that of the Italian Lohner machines. Length of ailerons, 3.47 meters; mean width, .90 meters.

Dimensions of the empennage or tail group: Length of horizontal stabilizer or tail-plane, 4.74 meters; width, 1.27 meters. Length of tail-flaps or elevators, 4.74 meters; width, 0.87 meters. The vertical rudder differs from that of the old Lohner machines in that there is a small balancing area forward of the pivot.

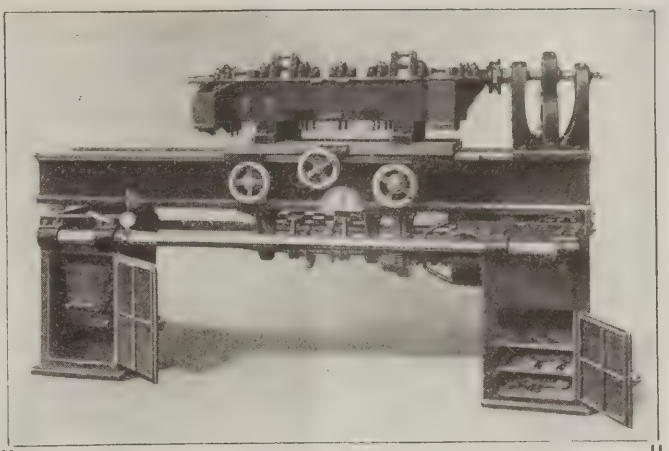
The principal dimensions of the hull are: Maximum width, 1.50 meters; maximum length, 12.50 meters; maximum height, 1.20 meters; step, .25 meters.

The body has two seats side by side and one in front, upon which is mounted a machine gun arranged to be movable and fired in any direction. Beside the pilot, next to the observer, there is also a machine gun arranged on a movable tube inside the casing. The outside tube is the only additional piece the machine contains.

The turret is armored. No bomb-dropping devices have been located. There are two vertical pieces of wood, with a circular profile notch fastened to the floats under the wings. It may be that these are used to drop large bombs, but no discovery has been made which would show how they are secured in them. Several hooks for small bombs were found.

The lateral or wing-floats, instead of being hemispherical in shape, have a bow with good streamlines, which plow on the water surface like the prow of a ship. The accompanying drawing shows their general outlines. Each is 88 cm. wide and 181 cm. long.

The engine, an Austro-Daimler, has 12 cylinders arranged in a V. It is rated at 300 H.P.



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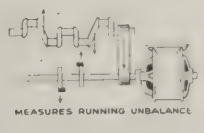
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FISKE HAS A PLAN TO END GERMAN FLEET

Rear Admiral Believes Allies Can Accomplish Feat With Aircraft

REAR ADMIRAL BRADLEY FISKE has written a letter to Mr. Alan R. Hawley, President of the Aero Club of America, in which he discusses the use of aeroplanes from the point of view of a strategist. In this letter Admiral Fiske points out that Germany's weak point is not her Army, but her Navy, and that her Navy can be destroyed by aeroplanes if the attack is made by sufficient numbers.

Admiral Fiske's letter follows:

"Dear Mr. Hawley:

"I beg leave to recall to your memory the various letters I have written to you during the year 1917, and to point out that the plan I suggested to you as soon as we entered the war and have urged upon you since of sending large units of aircraft to Europe has been approved in this country and abroad.

"As the year is now nearly ended and as the question of using aircraft in large units is now occupying the public attention in a high degre, I beg leave to request that you will exert your influence as president of the Aero Club of America to impress the public with the fact that the project of using aircraft for major aerial operations is not a foolish notion of fanatics in aeronautics, but is a sound idea, based on the principles of strategy.

Paramount Importance of Strategy

"The reason why it is necessary that any plan of operation should be based on the principles of strategy is *that strategy is the science and the art of planning and directing war.* The reason why Alexander conquered Darius three hundred years before the Christian era was the same as the reason why Prussia conquered France twenty-one centuries later, and why the various great commanders in the intervening years conquered their antagonists. The basic reason was not that the victors fought with the greater courage, or that they possessed the better weapons and equipments, but that they were directed by a more far-seeing and deep-thinking strategy.

"Strategy decides what is to be done. It has two assistants for doing afterwards the things decided on; one assistant is tactics, which actually fights each battle; the other assistant is logistics, which provides the weapons, ammunition, ships, men, transportation, equipments, food and money. An analogy may be pointed out between warfare and almost any other activity of men; for instance, the production of a play upon the stage—strategy having its counterpart in the play which is planned and written; tactics having its counterpart in the actual performance of the play by the actors; logistics having its counterpart in the work of the manager in providing the theatre, scenery, costumes, players and the money to pay the bills.

"A regular formula for use in solving strategic problems was invented and developed by the German General Staff some years ago, and it has been adopted by the armies and navies of the world.

"The problem is divided into four parts:

"(1) The mission, that is, the thing that ought to be done.

"(2) The difficulties in the way, such as the forces of the enemy and the efforts he will probably make.

"(3) Our means of accomplishing the mission and overcoming the forces of the enemy.

"(4) The decision.

"If we try to utilize this formula in the present war we see at once that the 'mission' is plain. It is to whip Germany.

"When we come to the second part we see that we may divide the forces of our enemy into three parts: Germany's economic establishment, Germany's military establishment and Germany's naval establishment. These three establishments support the government of Germany, just as three legs support a stool. They are joined together and are mutually dependent as are the legs of a stool, but if any one is broken, the government must fall down.

"If Germany's economic establishment is broken down, Germany cannot support the Army and Navy and therefore will have to give up; if her military establishment is broken down, the Allies can march to Berlin and compel Germany to give up; if her naval establishment is broken down, the Allies can form an impassable blockade around Germany which will shut off every means of communication with the outside world, even the means of submarines and compel Germany to give up.

"Coming to the third part of the problem, our facilities for accomplishing our mission against the opposing forces of Germany, we see that our means or facilities are the Army and Navy, backed by the enormous material resources of the United States. Naturally our Army would work with the Allied armies and our Navy with the Allied navies.

"Coming to the fourth part, the decision, we see that it amounts to deciding what we, or rather the Allies, are to do with our Army and Navy against the German Army and Navy, and also what the other resources of the Allies can do against Germany's economic establishment. History shows that, in times of war, the best way to destroy the economic establishment of an enemy is to use the destructive appliances of the Army and Navy which were designed and developed for that purpose. Such measures as embargo are extremely efficacious, but during actual war they have always been auxiliary to strategic measures.

"In order to make a wise decision as to what are the necessary steps to fulfill the mission, let us consult our only guide for the future, which is the history of the past. If we do this we find that our question is very old, indeed, and that it has been answered many times. The answer has already been, 'Battles; decisive battles.'

Wars Have Always Been Decided by Battles

"If one reads history reflectively he becomes impressed not only with the enormous effect on history of battles, but also with the small number of them that were individually decisive, even when an actual victory was achieved by either side.

"The most important book on this subject is 'Creasy's Fifteen Decisive Battles of the World.' In his preface, Creasy quotes Hallam as saying of the battle of Tours: 'It may justly be reckoned among those few battles of which a contrary event would have essentially varied the drama of the world in all subsequent scenes.'

"Each one of the battles described brought about a decision that was momentous to mankind. *Each battle as fought by the victor was the carrying out of a distinct and brilliant plan previously conceived by the mind.* In no battle did the victor fight with a vague intention, in no battle did the victor fight unprepared; in no battle was the strategy of the victor faulty or short-sighted; in no case did the government behind the victorious side have an erroneous or incomplete idea of the military situation.

Superior Decisiveness of Naval Battles

"One fact stands out clearly, and that is the fact that as a general rule naval battles in which there was an actual victory were much more decisive of future results than similar land battles. This is probably because ships that are disabled or destroyed cannot be repaired so quickly as buildings and other land works can; and because sailors cannot be replaced as readily as soldiers.

"The importance of naval battles was not realized until Mahan made us realize it. Mahan has passed away, but the light he lit still shines. By this light we see that the military battle of Waterloo was not really so decisive as the naval battle of Trafalgar, although Waterloo was the culminating battle against Napoleon. The battle of Trafalgar bore the same relation to the battle of Waterloo that in a game of chess the move which precedes the announcement of 'mate in (say) four moves' has to the last move of the game, which gives the culminating check-mate. When one player in a game of chess moves his piece and announces, 'Mate in four moves,' that move is the decisive move in the game and the subsequent move which finally check-mates the adversary is not the decisive move, although it is the culminating move. Nelson's victory at Trafalgar decided irrevocably that Napoleon's ambition for European dominion should end in failure, because it established the British navy as a permanent unbalanced force against him; the only unbalanced force among all the multifarious forces acting, the only force which Napoleon was powerless against. Trafalgar announced 'mate in four moves' to Napoleon; Waterloo was the check-mate. Even if Napoleon had gained Waterloo, he would have eventually failed, for the reason that Great Britain could prevent that free movement of warships and merchant ships upon the sea without which no country can maintain even a mediocre place in the family of nations.

"Even more clearly the battle between the Monitor and the Merrimac on March 9, 1862, and not the Battle of Gettysburg, was the decisive battle of our Civil War. Swinton points out in his 'Twelve Decisive Battles of Our War' that a victory by the Merrimac would not only have raised the existing blackade of the southern coast, but would have given the South the entire control of Hampton Roads and Chesapeake Bay, the mouths of the James and Potomac Rivers and the approaches from the south and east to Washington and Richmond and would have endangered New York besides. Concluding a long and keen discussion of the results that would surely have followed a victory by the Merrimac, Swinton says: 'The Confederacy would have received the alliance of one or both of those countries (meaning England and France) and the Republic would have been forever rent in twain.'

"The defeat of the Merrimac by the Monitor decided to which side victory would go, for the simple reason that it made it impossible for the South to get the necessary money, munitions and equipment with which to wage the war successfully. Even if the Confederacy had won at Gettysburg it would eventually have failed. The decision as to which side would win was given on the waters of Hampton Roads on the 9th of March, 1862, more than a year before Gettysburg was fought. Unfortunately this fact was not realized when the Monitor's victory was won, but now that we see that if it had been realized and if the North had merely held the Soutern Army in check thereafter and had devoted its major attention to the Navy and to the maintenance by the Navy of a more vigorous blockade, the war would have been decided with immeasurably less loss of time and blood and suffering.

Comparative Mercifulness of Naval Battles

"Our war with Spain was one of the most decisive wars that was ever waged; it was one of the most fruitful in permanent and great results, and yet the loss of time and blood was extremely small—smaller in proportion to the vast and permanent results achieved than in any war ever waged before. This was because it was a naval war, in which ships, which it is almost impossible to replace, were the targets for our guns, and not human beings which can easily be replaced.

"A like truth may be stated about the war between Russia and Japan. Countless thousands were slain and wounded in the land battles of Manchuria, with little or no result that we can see, but the naval battle of Tsushima, with comparatively small loss of life, settled the whole question between Japan and Russia in one historic hour.

"If the only way to win this war is to fight a long succession of enormous land battles, then we must fight them; but it may be advantageous to see if an alternative method less bloody but equally decisive can be devised. This idea seems worth thinking about, especially if we actually realize that the most decisive battles of history were not the most bloody; that some of them, like the battle of Santiago and the battle between the Moniter and the Merrimac, were comparatively bloodless, and that the battle of Manila did not cost a single life on the American side.

Aeroplanes Can Attack Weak Points

"Careful reflection about the decisive battles of the world seems to show us that in every case a strong attack was made against a point that was comparatively weak and yet was vital. Noting this, does it not occur to us at once that Germany's weakest point is her navy, that it is vital, too, and that therefore we should make a strong attack upon it? Her naval power is not protected behind vast mine fields just as the garrison of a fort in the olden days was protected behind the thick walls of a fort. *But the walls of the fort, when they could not be broken through were climbed over with scaling ladders, and the German mine fields can likewise be flown over with aeroplanes.*

"Some of these aeroplanes may be seaplanes that rise from North Sea waters, manned by navy men; while others may spring directly from the land, manned by army men. Coincidently with these attacks, great divisions of army warplanes may attack the enemy's bridges, munition depots and railroads behind his trenches in France, and thus prevent him from concentrating all his aerial forces in defense of Kiel and Wilhelmshaven.

Strategic Value of New Appliances

"It may be objected that the adoption of this suggestion would involve attaching undue importance to a new mechanical appliance. In answer it may be pointed out that all weapons are mechanical appliances, and that some of the greatest successes in war have been gained by utilizing new mechanical appliances. In fact, the principal factors in whatever successes the Germans have attained have been the new mortars with which they battered in the tops of the Belgian forts, their novel appliances for trench fighting, and their unexpectedly efficient submarines.

"It may also be pointed out that the aeroplane has established itself as a mechanical appliance of great reliability, that it can carry large destructive forces to strategic points more quickly than any other appliance can, that a squadron of Caproni aeroplanes recently made a flight of 875 miles without stopping, that the distance from England to Kiel and Wilhelmshaven is only 375 miles and 275 miles respectively, and that the distances to those places from Northeastern France are only 30 miles greater.

"It may be at the present moment that there are no aeroplanes that are able to carry full-sized torpedoes from England to Kiel, discharge the torpedoes and return to England, but there are aeroplanes in existence that fall short of such an ability by only a small percentage. Certainly, therefore, if no such aeroplanes do exist, they can be made to exist, and I am informed that they can, by one of the most competent aeronautical engineers in the world.

"It is instructive to recall the fact that of all the many factors that decided the result of the Russian-Japanese War the most important single factor was a new invention, the naval telescope sight—because it was the decisive Japanese victory at the naval battle of Tsushima that decided the outcome of the war by ruining every chance the Russians had of conquering Japan; because it was the enormous superiority in gunnery of the Japanese that gave the Japanese the victory, and because the enormous superiority in gunnery of the Japanese was due entirely to the fact that the Japanese guns were perfectly equipped with telescope sights, while the Russian guns were not.

"This same naval telescope sight is the means with which every gun in every Allied vessel, no matter how large or how small, is directed against the submarine. It is the most efficient weapon yet brought to bear against the submarine.

The German Navy Can Be Smashed

"Much hope is felt by the Allies now because of the apparent loss of effectiveness of the submarine attacks. Whether or not the submarine has been beaten, let us realize that the

(*Continued on page* 715)



THE NEWS OF THE WEEK



Rolls-Royce and Lancia Exhibit Aero Motors at Hotel Astor

The exhibition of two aeroplane motors which have won fame in battles abroad will be a feature of the fourteenth annual automobile salon, which will open in the grand ballroom of the Hotel Astor the day after New Year's.

One is a Lancia motor, fully described in a recent issue of "Aerial Age Weekly," duplicates of which have been used in Caproni and other Italian aircraft, which have made remarkable records, especially on bombing expeditions into Austrian territory. It will be exhibited by Thomas E. Adams.

The other is a 250-h.p Rolls-Royce motor, to be exhibited by Robert W. Schuette. It is an exact duplicate of the motors used in the Handley Page aeroplane, which recently made a world's record by flying with a crew of three men from London to Constantinople.

First Machine-made Liberty Aeroplane Engine Assembled

The first machine-made Liberty aeroplane engine was completed on Thanksgiving Day, and a substantial production is expected by the end of this month. With the beginning of quantity production of aeroplane motors and the increase in the number of skilled flyers being turned out at government schools, America's aerial program may be said to be within sight of realization. With increased output and sustained production, our aerial forces will gradually make themselves felt by our enemies.

When all plants are working on full schedule the production of engines will not only allow the United States its complete needs, but permit us to supplement the output of our Allies with many thousands of engines which they have asked us to supply.

Aerial Highways Endorsed in West

The Pacific Aero Club endorsed the project of the Aero Club of America for the establishment of transcontinental airways, to provide training for military aviators in cross-country flying.

The meeting was addressed by Major Hunter and Captain Inglehart, of the U. S. School of Military Aeronautics, University of California, Berkely.

Aviation Instructors Needed at Cornell University

The U. S. School of Military Aeronautics at Cornell University, Ithaca, N. Y., is in need of instructors for military training and telegraphy, according to a bulletin issued from the school to the College of Civil Engineering.

The instructors should be qualified to conduct intensive courses. Only men who have not been accepted for the draft can be accepted in this work.

Vocational Training Department

Washington.—Creation of a war training department to administer a system of vocational training for drafted men was announced by the Federal board for vocation training. This department will co-operate with the War Department and the Shipping Board in supplying skilled men for war work. The department will establish free vocational schools and classes to train men in large numbers. It is already training 15,000 radio and buzzer operators.

Loomis to Enter Air Field

Dayton.—Allen Loomis, formerly research engineer of the General Engineering Co., manufacturers of the Doble steam car, has joined the engineering force at the Dayton aeroplane factory. Loomis was appointed to this position at the request of Major J. G. Vincent, of the Aircraft Production Board.

Planes to Fly to Seaports?

Washington.—Evidently the Government is planning to have aeroplane fleets fly from places of assembly to Atlantic seaports. This supposition is borne out by a resolution adopted by the Aircraft Production Board, which has sent out instructions to the people in every part of the United States to keep away from an aeroplane which has made a forced landing.

Personal Pars.

A. P. Kirby is in the purchasing department of the aeroplane division of the Fisher Body Co., having resigned as assistant purchasing manager of the Continental Motors Corp.

Charles S. Ash, until recently chief engineer and inspector of the Wire Wheel Corp. of America, has been appointed to a similar position with the National Wire Wheel Works, Inc. He will have complete charge of engineering and manufacturing work.

Garabed Giragossian Free Energy for Motive Power

The Patents Committee have approved a resolution giving to the Government the use of a new force discovered by Garabed Giragossian, an Armenian, of Boston. It is claimed that the Garabed method will revolutionize the motive power of the world.

It will be remembered that at the last session of Congress both branches passed resolutions accepting the "Garabed" invention, but the bill was killed by the President, who allowed it to die by the "pocket veto."

Mr. Giragossian states that his only desire is to give the United States the exclusive use of his patents for the period of the war free, and to see that he will be protected in his patent rights after the war is finished.

S. A. E. Now Has 2,882 Members

At the regular monthly meeting of the Society of Automotive Engineers held at society headquarters in the Munsey Building today the resignation of Fred H. Glover of the Emerson-Brantingham Co., tractor manufacturer, as a member of the Tractor Standards Division was accepted. Mr. Glover is entering the Ordnance Department and it is expected will receive a Major's commission. His successor has not been appointed.

The membership report shows that the society's roll at present numbers 2,882, and that during the past fiscal year ending November 1, 800 new members were added. During that time applications for membership from 1,455 were received, but many of these have not qualified due to many entering the service.

Flottorp Mfg. Co. to Make Propellers

By the installation of new machinery and the employment of 300 cabinet makers and wood-workers, the Flottorp Mfg. Co., of Grand Rapids, Mich., is now fully equipped to start production of aeroplane propellers. The Chicago plant is still being used, but later all the manufacturing will be concentrated in the Nelson-Matter building, in Grand Rapids.

S. A. E. to Hold Dinners in New York and Chicago

Interest in the two winter meetings of the Society of Automotive Engineers, one to be held in New York on Thursday, January, 10, and the other to be held in Chicago on Friday, February 1, is indicated by the sale of tickets for the two dinners to be held in connection with these meetings. Already 633 tickets for the Automotive Industries dinner to be held in Hotel Biltmore, Thursday evening, January 10, have been paid for. Only 1,000 guests can be seated at that dinner, and it is now certain there will be a waiting list a week before the date for the dinner.

Tickets for the War Dinner in Chicago, at the New Morrison Hotel, on Friday evening, February 1, which is the Friday of Chicago show week, are selling fast, 441 having already been paid for at S. A. E. headquarters in this city. The Mid-west section in Chicago has taken 300 tickets, and hopes to have these sold by the first of the year. The New Morrison Hotel has a possible seating capacity of 1,500 and it is certain this capacity will be sold out perhaps ten days ahead of the date of the dinner.

The reasons behind the Liberty aviation engine, and the reasons behind the war truck, will constitute the major program of the meeting at the New York S. A. E. session on the afternoon of January 10. Four engineering authorities on aviation engineering will handle that part of the subject. Major Jesse G. Vincent, the father of the Liberty engine, will handle the subject first. He will be followed by Col. Clarke, Capt. Howard Marmon, and



The morning roll call at an aviation field "Somewhere in the United States." (Photo passed by censor)

H. M. Crane, the latter of the Simplex Automobile Co, which has been manufacturing the Hispano-Suiza engine for some time.

The Chicago meeting, to be held the afternoon of Friday, February 1, in the Crystal Room of Hotel Sherman, Chicago, will be devoted entirely to farm tractor subjects. George T. Strite, tractor engineer, will present a paper on fundamentals of tractor design. This will be followed by a special paper on the fundamentals of the ideal engine for farm tractors. Following this will be another paper on the fundamentals of transmission systems for the ideal tractor. One of the best authorities on crude oil, gasoline, and kerosene, will give a paper on the most desirable tractor fuel.

Bureau of Navigation Has Standardized Aviation Instruments and Equipment

Under the head of aviation instruments and equipment, the annual report to the Bureau of Navigation, Rear Admiral Howard, superintendent of the Naval Observatory, says:

"As noted in the last annual report, the year started without any instruments or equipment for aviation, under the cognizance of the Bureau of Navigation, having been standardized.

"Sets of clothing as used in the British and French aviation services were inspected at the observatory and at the aeronautic station at Pensacola, as well as sets manufactured by American firms. A board was appointed at Pensacola to specify a standard equipment and their report has been approved. The Bureau of Supplies and Accounts now has specifications for standard articles of clothing and personal equipment approved by the department and is engaged in the purchase and issue of this material.

"In conjunction with the station at Pensacola and other commands engaged in flying, the observatory has practically accepted as standard an altimeter (altitude aneroid barometer) and a clock. A compass for aircraft has been adopted and issued but is not proving entirely satisfactory and further experiments are under way.

"One form of statoscope for dirigibles has been found satisfactory for certain purposes and will be issued to each dirigible when delivered. This is the Custer type. This instrument is non-luminous and does not indicate speed or amount of change of height. The observatory is assisting various inventors and makers of instruments to devise a statoscope that will answer all requirements.

"The observatory has on hand a small number of aeroplane cameras of acceptable design. These are not fixed in the car and their value will have to be determined in service. Other forms of cameras are under trial."

Secretary Daniels Testifies Before House Committee

In his testimony before the House Sub-Committee which is investigating the work of the Navy Department, Mr. Daniels, Secretary of the Navy, outlined the purpose and plan of the Naval Aircraft Factory, and gave figures in regard to the growth of the Naval Air Service, as follows:

Mr. Britten: Mr. Secretary, you suggested that for the improvement in the aeroplane force you are erecting a factory?

Secretary Daniels: Yes.

Mr. Britten: Is it the intention of the department to build all the aeroplanes for the Navy or will you contract for some of them; and if so, have you contracted for any?

Secretary Daniels: We have contracted for very many. We wish to build as many as we can and we wish to experiment as well as build. We wish very much to be able to build enough to add largely to our facilities, and also to enable us to know what it costs to build aircraft. My theory about aeroplanes is the same as it is about submarines, destroyers, and ships of all characters, and that is that the Government must build a number of them for the reason that the Government will then have facilities of all kinds that are needed. We will also know exactly what it costs to make them, and in that way be able to protect ourselves in the price.

Mr. Britton: You have not enlarged any, have you, on the aeronautical department, or whatever you might call it? The Bureau of Aviation is under Operations, is it not?

Secretary Daniels: The Aviation Service has been greatly enlarged and strengthened. We have a captain of the Navy under Operations in charge and a staff composed of able men. I might say this much, that the increase in material in aircraft in the Navy during this fiscal year has been approximately 1,400 per cent; in personnel, trained and untrained, there has been an increase of 3,000 per cent; in stations and training schools there has been an increase approximately of 3,200 per cent, and we are steadily getting better results. The problem now is to get Navy aircraft, and we have given orders for all that can be built. We have schools and stations, and we are moving forward.

Surgeon-General of Navy Has Studied Aviation Problems

In his annual report to the Secretary of the Navy, Surgeon-General Braisted reports that he has made a special study of tests for determining the fitness of applicants for the air service. This portion of the report is quoted in full:

"The problems of aviation have naturally received deep thought and been made the subject of much painstaking investigation by this bureau, which is intimately concerned with them through its obligation to determine a standard of fitness for candidates for the corps. A great many points have to be considered, as, for example, the weight to be given to evidence of practical experience and efficiency. The bureau has kept in close touch with the scientific investigations and experiments being conducted with a view to elaborating a definite and concise method of testing the psychic factors and the psychomotor phenomena that come into play with flying and the physical effects of high atmospheric tenuity.

"Experiments and observations are also being made by the naval ear specialist in Washington, Surg. G. B. Trible, United States Navy, who is at present studying the question of fitness for aviation training in all its aspects."

Northcliffe Ridicules Faint-hearted Britishers

Lord Northcliffe, in an interview with a representative of the "Thanet Advertiser," expresses surprise that some of his neighbors have moved to London and other places.

"The losses of life," said Lord Northcliffe, "owing to the German air and marine raids have been practically nil. When I was in America, to which I am returning, 95 people died of heat in New York City in one week alone. I did not hear of any inhabitants flying from New York, although there are plenty of cool places within reach. The vague communiqués referring to 'Southeast England' make many people in London and elsewhere think that Thanet is the main centre of German attacks. Even if it were the centre it would not amount to very much. The real effect of these raids is to rouse Americans.

"As to the question of compensation for trade losses due to the German mosquitoes, Thanet bears a grossly unfair share of its burden of war, and should be handsomely recompensed by the rest of the United Kingdom. If I were not about to return to the United States I would take the matter up with the authorities."

Lord Northcliffe to Work on American Aircraft Production

Despite his refusal of the Air Ministry, Lord Northcliffe proposes to spend much of his energy on American aeroplane production, upon his return here.

He is quoted in *Flight* as follows:

"If the Government so desire, I propose devoting much of my time to aircraft production in the United States. I have with me a mass of figures and facts to lay before the War Cabinet, Sir William Weir, and Mr. Churchill. My great fear is that the American output will exceed the possibilities of training officers and mechanics. The Americans are willing to make any type of engine we ask, in addition to their own Liberty engine."

Lord Northcliffe is owner of numerous newspapers and publications, but has laid aside all his personal business to concentrate on winning the war. He is quoted as follows:

"I have no business except winning the war. I did not see a single copy of my newspapers from May till November. They were left in capable hands, and I was able to devote the whole of my time to the administration of my bureau in New York and Washington."

Harmon Kline in Aviation Work

Mr. Harmon J. Kline has resigned as designing engineer of the Olds Motor Works, Lansing, Mich., and is now in the Anti-Aircraft Section, Carriage Division, Ordnance Department, Washington.



Group of aviation enthusiasts and experts, including Major Underwood, Major C. D. M. Campbell, Major Decker, and Major Banning. (Photo passed by censor)

Raids Depress Germans, Says Baker

According to information received by "observers" the air raids on Germany are having a very depressing effect on the German population, announced Secretary of War Baker in the weekly official announcement. The paragraph on air raids is quoted below:

"Reports of observers recently out of Germany who were present during previous air raids state these raids have had a very depressing effect on the civilian population, and have heightened the growing discontent among the German people, which now for the first time are being brought face to face with war conditions."

Farmers Try to Repel "Air Raid"

The first and second flights of the newly opened balloon school at Macon, Georgia, were not cordially received by nearby farmers. Both flights were met by several rounds of shot. Balloonist Jewell reports his experience as follows:

"About twelve miles from Macon two men rushed out with a shotgun and although I was too far up to be hit, yet I could distinctly hear the report of the gun and hear one man say to the other:

" 'Shoot again, John; maybe you will hit him the next time.' "

Control Device Tested at Rantoul

A system of aeroplane control which gives a pilot free use of his hands, thus permitting him to operate his gun, reload pistol or machine gun, or operate his fire extinguisher, has been tested and found very satisfactory at the army aviation field at Rantoul, Ills. The controls are manipulate by means of the knees.

Ensign Page Killed in Seaplane Accident

The Navy Department announced that Ensign Phillips Ward Page, of Brookline, Mass., was killed in England, December 17th, in a seaplane accident.

Ensign Page enlisted in the Flying Corps of the Naval Reserve last May. He had been in England since November 10th. Page graduated from Harvard in 1909 and for years was a member of the Boston Herald editorial staff. He studied aviation under Harry Atwood and at the Burges Aviation School.

Lieut. Willis Found in German Prison Camp

Lieutenant Harold B. Willis, of Newton, Mass., has finally succeeded in communicating with his relatives. He disappeared over the German lines on August 18th, and his letter was three and a half months on the way. Lieutenant Willis was a member of the Lafayette Escadrille, and describes his last flight as follows:

"My last flight was some distance within the lines. One of the boys in front of me attacked and I was able to put away my assailant, but was immediately jumped on by two others, later by a third. To avoid being riddled from the rear I had to turn and engage, and was thus seperated from friends on my level. French machines above me evidently did not see my situation.

"Almost immediately my motor was hit and only ran intermittently, so that they could always keep above me. My efforts became the avoidance of fire on the line of flight and to regain the group of lines. I did not succeed, however, in any of these on account of loss of motor and the odds against me. I landed twenty kilometers in the rear.

"An adversary landed beside me and proved very correct and sympathetic. My machine was hit thirty times, in body, motor and windshield. Half the cables were cut, tire shot away and an unknown number of holes in the wings.

"They took me to lunch and later to the rear. The treatment since continues correct.

"My chief distress has been my inability to tell you of my safety, and further, my exile from the front and fighting.

"Am with splendid French officers. Am studying German, doing sketching and woodcarving."

"The Flyer's Guide"

Students of aviation will find "The Flyer's Guide" an instructive and stimulating little volume. It is designed to serve as an elemental handbook for aviators, and, while more than a primer in the new science, it is still sufficiently simple in its treatment to serve the beginner. Its author, Captain N. J. Gill of the Royal Artillery, has evidently had considerable experience in flying, which makes the present book eminently practical and helpful. The subjects treated and illustrated are just such as the student beginning to fly will encounter. The book is written throughout in very simple readable style. In the first chapter, which is aptly entitled "On Taking a Ticket," the author gives much practical advice on selecting an easy machine for training, the choice of instruments and the proper clothing to be worn in flying. In a very intimate conversational fashion the book goes on to advise the best air tactics under varying conditions. Considerable attention is given to the types of aeroplanes, their care and maintenance and the theory of flight when the reader is gradually advanced to the consideration of more technical points. Fully half the book is devoted to a discussion of internal combustion engines and ignition devices with many diagrams. In the hundred pages which comprise the volume the author has gathered in convenient form a surprising amount of excellent material.

"The Flyer's Guide," by Captain N. J. Gill. This book can be obtained from The Aeronautic Library, 280 Madison Avenue, New York City. The price is $1.60 postpaid.

Practical Aviation

An excellent book of practical instruction at a reasonable price is offered in "The Eyes of the Army and Navy," by Albert H. Munday, Flight Lieutenant, R. N. The information gained from the government text books is presented here tersely and in convenient form by a practical flyer of wide experience. The comprehensive nature of the book may be judged from the chapter heads, including aerial navigation, the theory of flight, map reading, cross-country flying, charts, meteorology, aero engines, wireless telegraphy, aerial photography, bombs and bomb dropping and aerial fighting. The book presupposes considerable elemental knowledge of aviation on the part of the reader. The student will find the system adopted in paragraphing the subjects very helpful. The illustrations are very complete for so small a book. The author has made a special effort to eliminate all unnecessary technicalities and formulae, and shorten the road in every possible way for the student of flying. The author has seen service on the French, Belgian and British battle fronts and dates his book, "In the Field," 1917, which indicates the practical nature of his training.

"The Eyes of the Army and Navy. Practical Aviation," by Albert H. Munday. This book can be obtained from The Aeronautic Library, 280 Madison Avenue, New York City. The price is $1.60 postpaid.

Britain Announces Aerial Mail Service

The Postmaster-General of Great Britain has announced that after the war it is intended to inaugurate and carry on aerial postal services between London and the various European capitals. The question of an economic outlawry of German is disregarded in his statement.

Flight discusses the announcement as follows:

"Be it observed that Mr. Illingworth did not qualify his announcement. He did not say that if experiment demonstrates it to be practical, or if the proper type of aeroplane can be evolved we *may* have aerial postal services. Not at all. We *are* to have them, because—and this is the point that matters—the postal authorities, having watched the aeroplane through all its stages of development, *know* that they are absolutely safe in taking all their account with the new factor in locomotion."

Billy Sunday's Son Now Lieutenant in Aviation Section

George Sunday is now a Lieutenant in the Aviation Corps. Although exempted because of his wife and two children, he enlisted some time ago in the Service.

"He said he felt that his country needed him," stated Billy, "so I told him I'd take care of Harriett and the two children while he was gone. Now I'm having a hard time keeping Billy, Jr., seventeen, from enlisting, too. These aeroplanes go about 125 miles an hour, but at that they'll be too slow for George."

Secretary Baker's Report Praises Support of Aeronautic Industry

Secretary Baker, in his report to President Wilson recently made public, describes America's enthusiasm for aviation and "the fine capacity of our people to seize a new and infant art," and reviews the development of the aviation branch of the Army as follows:

"The report of the Chief Signal Officer, which accompanies this, is necessarily reserved in its discussion of details; but it contains the outlines of a romance, the story of a new development of subtle adaptations and of the fine capacity of our people to seize a new and infant art, make themselves masters of it, and work out its mechanical development under the spur of the country's need for patriotic service. We are dealing here with instruments which for military reasons can not be described, and with activities which can not prudently now be detailed; but the standardization of planes, engines, and parts to facilitate quantity production, the development of the Liberty motor and the generous co-operation of scientists, engineers and manufacturers to speed and perfect these devises will be recognized as performances which justify the confidence of the Congress in providing so generously for this most important military development."

Italian Flyer Rises to 23,048 Feet

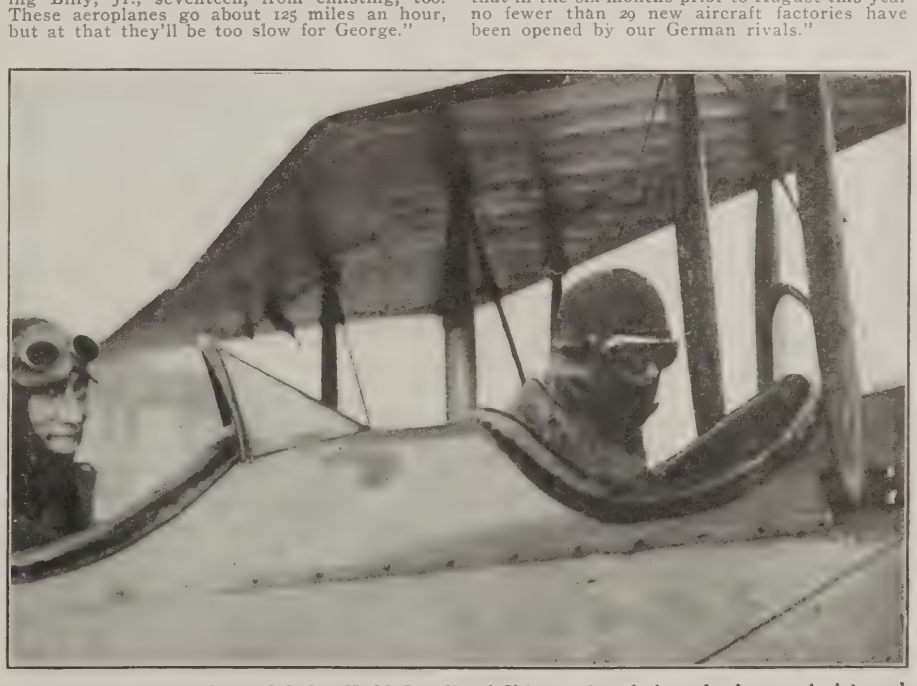
Lieut. Brachpapa, of the Italian Army Air Service, attained an altitude of 23,048 feet, flying an Italian aeroplane, mounting to this altitude in 65 minutes.

This is not an altitude record. On July 14, 1914, a German pilot named Oelrich rose 25,765 feet, while H. G. Hawker, an English aviator, reached 23,622 feet at Hendon in April, 1916.

British Air Minister Must Out Produce Germans

In discussing the Air Force Bill, Mr. Joynson-Hicks urged concentration on problems of production, in order to not only keep pace with increased German production, but to out-produce Germany. Some of his remarks are quoted:

"The new Secretary of State with his Air Council must first, after he has got over the initial difficulties of instituting his new forces, devote himself, in conjunction with the Ministry of Munitions, to production. I have pleaded before this House, and I am going to plead very shortly again, for bigger machines and more high-power engines. The new force should not be content to get equal with the Germans, to make machines as good as the latest German machines, but should go boldly one better, jump over the heads of the Germans, and have machines bigger, faster and better than the German machines. Everybody knows that the Germans are devoting all their manufacturing efforts at the present time to the creation of a still larger air service for use against Great Britain and our forces both at the front and at home in the spring of next year. We know that the Germans are enlarging their plant for air purposes, that they have placed large numbers of orders in Switzerland for the production of air engines, that the Fokker Co. itself has taken over an enormous piano factory in Schwerin in order to manufacture aeroplanes, that they are building three-seater bombers carrying over a ton of bombing material, that they are now building two and three-engined machines provided with electric heaters, and that in the six months prior to August this year no fewer than 29 new aircraft factories have been opened by our German rivals."



Lieut. Harold Schroeder and Judge K. M. Landis of Chicago, just before the famous jurist made his initial flight

NAVAL and MILITARY AERONAUTICS

Signal Corps Aviation School

The following is a roster of officers on duty at the Signal Corps Aviation School, Chanute Field, Rantoul, Ill., corrected to Nov. 27, 1917:

Commanding post and school, Lieut. Col. F. M. Jones.

Administration, Maj. M. Connolly, adjutant; First Lieut. B. McMullen, assistant adjutant, survey and summary court.

Supply Q. M. C., Capt. A. Filler, Q. M.; First Lieut. Roy R. Showalter, assistant police and prison officer.

Supply S. C., First Lieuts. W. E. Lewis, supply and disbursing; P. I. Kemp, assistant to supply.

Medical, Capts. Chester H. Clark, post surgeon; C. Berens, Jr., L. C. Collins, First Lieuts. R. G. Cressman, O. Yarnell, W. J. Smott, T. E. Jones, C. C. Fuson, P. H. Fowler, G. E. Brand, Dental Corps.

Engineering Department, First Lieuts. H. W. Flickinger, engineer officer; H. M. Smith, A. E. O., hangars; R. G. Page, A. E. O., shops; R. Tower, A. E. O., shops; R. H. Carpenter, A. E. O., garage; W. F. Jones, A. E. O., flying-field; H. Marcus, machine shop.

Gunnery officer, First Lieut. W. H. Murphy, First Lieut. B. McMullen, A. G. O.; Cadet H. Q. Russell, A. G. O.

Construction, First Lieut. R. E. Schenck.

Post exchange, Capt. W. W. Spain, exchange officer.

Fire Department, First Lieuts. R. R. Showalter, fire marshal; W. H. Murphy and R. Tower, assistants.

Department of Flying, Maj. T. Hanley, Jr., officer in charge; Capt. W. W. Sqin, A. F. O.; First Lieut. E. W. Kilgore, A. F. O.; First Lieuts. J. M. Foote, A. F. O.; P. Dodge, A. F. O.; W. H. Murphy, A. F. O.; R. W. Schroeder, A. F. O.; G. H. Hughes, A. F. O.

Theoretical Instruction, Majs. Charles C. Benedict, in charge, and A. H. Kilkeson, map reading, miniature range and photographic interpretation; First Lieuts. H. W. Flickinger, and assistants repair and assembly of motors, wood, fabrics, organization and operation; W. H. Murphy, gunnery; B. McMullen, assistant in gunnery; C. S. Roberts, I. D. R., M. G. D., A. P. W., drill and calisthenics; Cadet H. Q. Russell, assistant in gunnery; First Class Sergt. E. C. Hays, 39th Squadron telegraphy.

Assigned to Squadrons: 38th Squadron, Maj. A. Kilkeson, commanding; First Lieuts. P. Dodge, supply, J. M. Foote, R. G. Page, R. Tower, C. S. Keyes, R. B. Darkins.

39th Squadron, First Lieuts. H. M. Smith, commanding; R. H. Carpenter, supply, E. W. Kilgore, G. H. Hughes, R. R. Showalter, W. F. Jones, P. C. Kemp, H. Marcus.

Detachment Flying Cadets, First Lieuts. R. C. Disque, C. S. Roberts.

Special Orders

First Lieuts. Bernard P. Rooney and Galen R. Horner, Av. Sec. S. R. C. active duty, Wichita Falls, Texas

Private Warner W. Kent, Av. Sec. S. R. C., candidate for commission S. C. Aviation School for Non-flying Officers, Kelly Field, S. San Antonio, Texas.

Second Lieut. Harold T. Kav, Av. Sec. S. R. C., active duty, Portland, Oregon.

Second Lieut. George L. Campbell, Av. Sec. S. R. C., active duty, Portland, Oregon.

First Lieut. Arnold Joerns, Av. Sec. S. R. C., active duty, Chief Signal Officer of the Army.

Following named officers Av. Sec. S. R. C., regular participation in aerial flights after dates given:

First. Lieut. Henry S. Houghton, November 10, 1917.

First Lieut. Harold E. Watson, October 27, 1917.

Capt. Charles H. Hammond, Av. Sec. S. R. C., to active duty, St. Louis, Mo.

Capt Elmo L. Davison, Av. Sec. S. R. C., active duty, Fort Omaha, Neb.

First Lieuts. Albert E. Galvin, James F. Frenzel, Albert G. Simpson, Samuel J. Mustain, Mark L. Herron, Lawrence E. Cook and Herbert H. McVey, Av. Sec. S. R. C. active duty, Garden City, Long Island, N. Y.



Lieut. Olive Warman, of Philadelphia, winner of Distinguished Service Order and The Military Cross, has fifteen enemy planes to his credit.—British official photo.

Second Lieut. John H. Bauer, Av. Sec. S. R. C., active duty to Indianapolis, Ind.

Captain Frederic de Peyster Townsent, Av. Sec. S. R. C., active duty, to Chief Signal Officer of the Army.

First Lieut. Lester F. Gilbert, Av. Sec. S. R. C., active duty, Buffalo, N. Y.

First Lieuts Geo. M. Roper, Jno. DeForrest and George R. Abel, Av. Sec. S. R. C., active duty, Kelly Field, S. San Antonio, Texas.

First Lieut. Edmond M. deBerri, Signal Corps, is assigned to active duty and will proceed from Chicago, Ill., to Washington, D. C., and report in person to the Chief Signal Officer of the Army for assignment to duty.



Lieut. John M. Foote, who made a distance flight from Rantoul, Ill., to San Francisco in an L. W. F. biplane.

The travel directed is necessary in the military service.

The honorable discharge, by direction of the President, of First Lieut. Albert F. Glass, Signal Corps, National Guard of the United States (Wisconsin), from the service of the United States, under the provisions of section 9 of the act of May 18, 1917, effective December 5, 1917, is hereby announced.

Capt. Robert H. Young, Aviation Section, Signal Reserve Corps, is ordered to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

A board of officers to consist of Maj. Edwin V. Sumner, Jr., Signal Corps; Capt. C. M. Tichenor, Signal Corps, and Capt. Compton Wilson, Medical Reserve Corps, is appointed to meet in this city, December 6, 1917, or as soon thereafter as practicable, for the examination of civilians for commission in the four motor mechanics' regiments to be organized under the acts of Congress of May 18, 1917, and July 24, 1917.

Such journeys as it may be necessary for the members of the board to make in the vicinity of the automobile centers of the country for the purpose of examining applicants are necessary in the military service.

First Lieut. John J. O'Brien, Jr., Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Lawrence Higgins, Signal Reserve Corps, is assigned to active duty and will report in person to the chief, War College Division, Washington, D. C., for duty.

First Lieut. John F. Patterson, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.

Special Orders 275 and 276

Second Lieut. Alfred M. Goodloe, Signal Corps, will proceed to Morrison, Va., and report to the commanding officer, aviation conceneration camp, for duty.

First Lieut. Louis Levy, Medical Reserve Corps, is relieved from duty with the physical examining unit, Aviation Section, Signal Corps, Seattle, Wash., and will proceed to Salt Lake City, Utah, for the purpose of establishing a physical unit at that place, and will report by letter to the Chief Signal Officer, Washington, D. C.

First Lieut. Josiah T. Tubby, Signal Corps, will proceed to Garden City, Long Island, New York, and upon arrival will report in person to the commanding officer, aeronautical concentration camp, for duty with a squadron.

Second Lieut. John F. Coad, Signal Corps, will proceed to Morrison, Va.. and upon arrival will report in person to the commanding officer, aviation concentration camp, for duty.

First Lieut. LeRoy D. Lewis, Signal Corps, will proceed to Battle Creek, Mich., and report to the commanding officer, Camp Custer, for instructions to accompany recruits to Vancouver Barracks, Washington, and upon arrival will report to Col. Brice P. Disque, Signal Corps, Yeon Building, Portland, Ore., for duty.

First Lieut. Louis R. Crawford, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to South San Antonio, Texas, and report in person to the commanding officer, Kelly Field, for assignment to duty.

First Lieut. Austin A. Howe, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for duty.

First Lieut. Clarence E. Hall, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, New York, and report in person to the commanding officer, aeronautical concentration camp, for assignment to duty.

First Lieut. Herbert Godwin, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, New York, reporting to the commanding officer, aeronautical concentration camp, for assignment to duty.

Second Lieut. George P. Diemer, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., reporting to the commanding officer, aviation concentration camp, for duty.

Second Lieut. William H. Lazarus, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, New York, and report in person to the commanding officer, aeronautical concentration camp, for assignment to duty.

Capt. Edwin W. Dunlap, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed without delay to San Antonio, Tex., and take station as president, aviation examining board, and report by telegraph to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

First Lieut. Harry F. Littiejohn, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed without delay to Detroit, Mich., and report in person to Capt. Paul B. Holmes at the Packard Motor Car Co. for duty. The travel directed is necessary in the military service.

The following-named officers of the Aviation Section, Signal Reserve Corps, are announced as on duty requiring them to participate regularly and frequently in aerial flights from the dates set after their names: First Lieut. Martin T. Chamberlin, November 10, 1917; First Lieut. Russell E. Collins, November 7, 1917; First Lieut. Charles M. Conrad, October 16, 1917; First Lieut. William W. Crehoe, Jr., October 16, 1917; First Lieut. Gordon Dodge, September 7, 1917; First Lieut. Joseph G. Halsey, October 29, 1917; First Lieut. William G. Kollock, November 19, 1917; First Lieut. George C. Kull, November 19, 1917; First Lieut. Bernard A. Law, November 19, 1917; First Lieut. Howard H. Powel, October 11, 1917; First Lieut. Lloyd G. Schultz, October 25, 1917.

Orders heretofore issued directing the following-named officers, Aviation Section, Signal Reserve Corps, to report at Kelly Field, South San Antonio, Tex., on or about December 15, 1917, are amended so as to direct those officers to report in person to the commanding general, Camp Hancock, Augusta, Ga., on December 10, 1917, for duty in the administration of the Signal Corps camp for motor mechanics to be organized at that place: Capt. Norman Alexander Buckley, Capt. Thurlow White, Capt. John H. Sherman. The travel directed is necessary in the military service.

Maj. Jacob W. S. Wuest, Signal Corps, will proceed to this city and report in person to the Chief Signal Officer of the Army for assignment to duty. The travel directed is necessary in the military service.

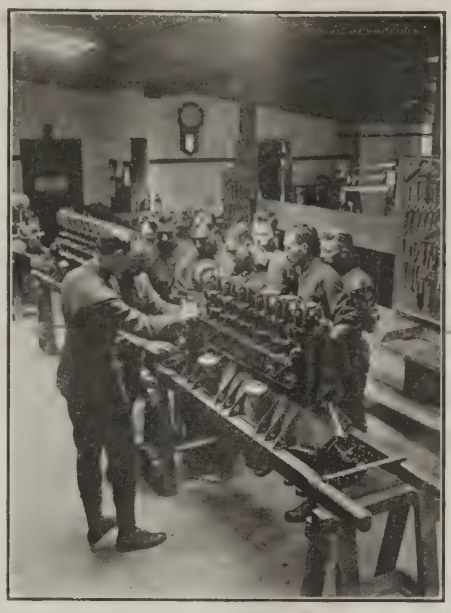
First Lieut. Clarence F. Adams, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Army Balloon School, Omaha, Nebr., for assignment to duty.

First Lieut. Harland H. Cowle, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for assignment to duty with a squadran.

Maj. Theodore Charles Macaulay, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Rockwell Field, San Diego, Cal., for assignment to duty.

The following-named officers, Signal Corps, will proceed to the places hereinafter specified after their names and report in person to the commanding officer of the School of Military Aeronautics for assignment to duty: Capt. Eugene C. Braig, Princeton, N. J.; First Lieut. James Hough, Ithaca, N. Y.; First Lieut. Herbert G. Knight, Cambridge, Mass.; First Lieut. James L. McGrath, Champaign, Ill.; First Lieut. William T. Lynch, Atlanta, Ga.; First Lieut. Cecil Hewitt, Austin, Tex.; First Lieut. Carl Grosse, Columbus, Ohio; Second Lieut. Augustus M. Lawrence, Austin, Tex.; Second Lieut. Jacob Mary, Berkeley, Cal.; Second Lieut. Thomas A. Barrett, Princeton, N. J. The travel directed is necessary in the military service.

First Lieut. William J. Wakeman, Aviation Section, Signal Reserve Corps, is ordered to active duty and will proceed to Portland, Ore., and report in person to Col. Brice P. Disque, Signal Corps, for assignment to duty. The travel directed is necessary in the military service.



Members of America's new air army are given a thorough knowledge of aeroplane engines in the great "Ground Schools" where the fundamentals of aviation are being taught. —Photo passed by censor.

First Lieut. Joseph B. White, Aviation Section, Signal Reserve Corps, will proceed to Cambridge, Mass., and report in person to the commanding officer, School of Military Aeronautics, for assignment to duty. The travel directed is necessary in the military service.

Maj. Arthur E. Wilbourn, Signal Corps, will proceed to this city and report to the Chief Signal Officer of the Army for temporary duty, and upon completion of same will proceed to Fairfield, Ohio, and take command of Signal Corps Aviation School at that place. The travel directed is necessary in the military service.

Special Orders 288 and 289

The following-named officers of the Medical Reserve Corps are relieved from duty at aviation mobilization camp, Montgomery, Ala., and



This cryptic radio message is being flashed by one of Uncle Sam's prospective airmen to indicate the exact location of an enemy's battery or a bursting shell on the battle sector reproduced before him. It indicates his opinion that the shell fell too far to the left, perhaps. His accuracy and speed in transmission immediately show whether he is fitted for the great responsibility of the new American air army. The map before him is an enlargement of an actual reproduction of part of the European battlefront thrown on a large canvass screen with the various woods, roads, trenches, and houses painted in, exactly as they would appear from a plane 6,000 feet in the air.—Photo passed by censor.

will proceed to Augusta, Ga., and report in person to the commanding general, 28th Division, Camp Hancock, that place, for duty with motor mechanic regiments, and by letter to the Chief Signal Officer, Washington, D. C.: Capt. Edgar S. Bullis, Capt. Gustavus C. Darlington, Capt. Charles Dudley, Capt. Charles E. Long, First Lieut. Bruce H. Beeler, First Lieut. John M. Beggs, First Lieut. Edward P. Evans, First Lieut. Wylie R. Felts, First Lieut. Albon E. Fichtner, First Lieut. Frank Hedges, First Lieut. William L. Howell, First Lieut Robert A. Irvin, First Lieut. Benjamin W. Kelly, First Lieut. Albert H. Kulig, First Lieut. William H. Meddaugh, First Lieut. Irvin C. Munger, First Lieut. Charles M. Pearson, First Lieut. Thomas S. Venard, First Lieut. Edward C. Wittwer. The travel directed is necessary in the military service.

First Lieut. Samuel Walker Terry, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Post Field, Fort Sill, Okla., for assignment to duty.

First Lieut. William G. Rector, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Kelly Field, San Antonio, Tex., for assignment to duty.

Capt. Fiorello H. LaGuardia, 8th Aviation Instruction Detachment, is announced as on duty requiring him to participate regularly and frequently in aerial flights from October 16, 1917.

Temporary Second Lieut. James C. Lewis, Signal Corps, will proceed to Garden City, Long Island, N. Y., and report to the commanding officer, that place, for duty. The travel directed is necessary in the military service.

Second Lieut. Joseph Kozial, Signal Corps, will report without delay to the commanding officer, Kelly Field, San Antonio, Tex., for duty.

First Lieut. John Phillip Pepper, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, aviation depot, Garden City, Long Island, N. Y., for assignment to duty.

Second Lieut. Norman K. Wilson, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, that place, for assignment to duty. The travel directed is necessary in the military service.

First Lieut. Daniel E. Miller, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Kelly Field, San Antonio, Tex., for assignment to duty.

Second Lieut. Erwin E. Dreece, Sig. Res. Corps, active duty at College Park, Md., reporting to the Commanding Officer, Radio School, Maryland State Agricultural College.

Second Lieut. Thomas H. Latimer, Jr., S. R. C., to Selfridge Field, Mount Clemens, Mich.

First Lieut. George R. White, Av. Sec., S. R. C., to Hazlehurst Field, Mineola, L. I., N. Y.

First Lieut. James A. Reilly, Sig. Res. Corps, appointed to grade of temporary Captain in the Signal Corps, U. S. Army, with rank from October 17, 1917.

Capt. Reece M. Newport, Av. Sec., S. R. C., appointed member of board to examine applicants for commission in Aviation Section, S. R. C.

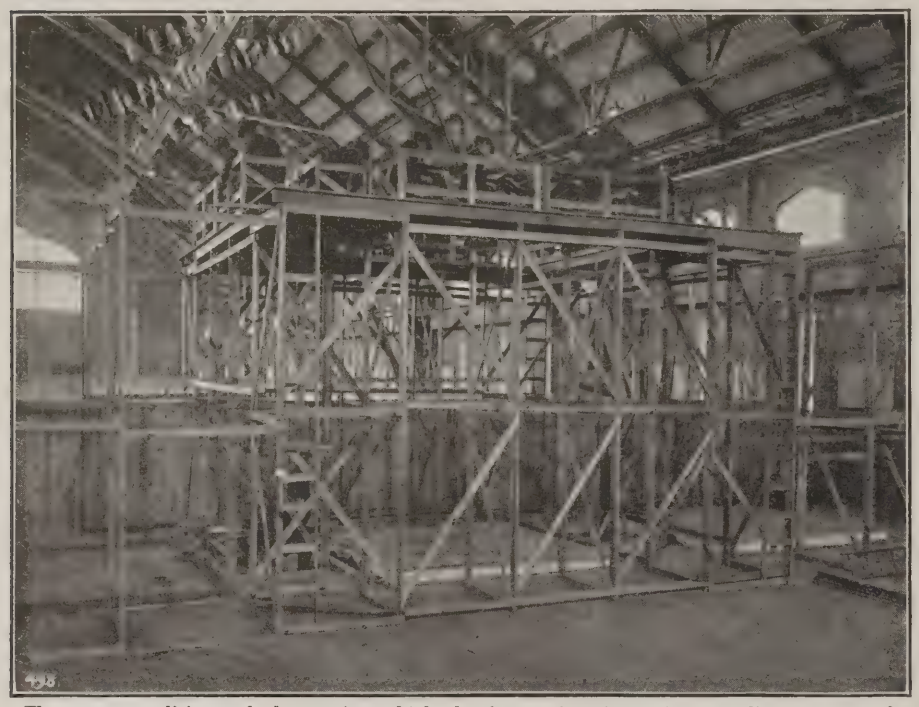
The following officers rated junior military aviators to date from November 14, 1917: Capt. Dean Smith, Av. Sec., S. R. C., First Lieut. Junius B. Alexander, S. C., First Lieut. Almon Stroupe, S. C., First Lieut. Frank W. Wright, S. C., First Lieut. Emert Shields, S. C., First Lieut. Ernest Clark, S. C., First Lieut. George A. Furrow, S. C., First Lieut. Arthur A. R. Scheleen, S. C.

First Lieut. Ernest K. White, S. C., to Camp MacArthur, Waco, Tex., for duty.

Capt. H. B. Oakleaf, S. C., U. S. Army, to Chief Signal Officer of the Army for assignment.

First Lieut. James B. Kilburn, S. R. C., to active duty, reporting to the Chief Signal Officer for duty, effective January 18, 1918.

A board of officers to consist of First Lieut. Lester F. Gilbert, Av. Sec., S. R. C., and Capt. George L. Cott, Med. Res. Corps, appointed to meet at Buffalo, N. Y., to examine applicants for commission in Aviation Section, Signal Corps Reserves.



The exact conditions of observation which the future American airmen will meet over the German trenches in France are here reproduced to give them instruction in artillery reporting, observation and transmission of intelligence by radio. The prospective flyers at the top of the picture are looking down as from an aeroplane 6,000 feet in the air on accurate reproductions of parts of the front lines. The instructor causes various lights to flash upon the battle sector represented on the map, while the cadets immediately radio the location of the battery or the bursting shells by means of the radio instruments at their right hands. Their accuracy in observation and speed in transmission gives certain proof as to whether they are qualified in that part of the work for the vital responsibilities of the American army.—Photo passed by censor.

Major Geoffrey H. Bonnell, Av. Sec., S. C., rated junior military aviator, to date from November 17, 1917.

Capt. Frederick Libby, 22d Aero Squadron, S. C., to Hot Springs for treatment.

Second Lieut. Meyer S. Lentz, S. C., to Chief Signal Officer of the Army for duty.

First Lieut. William O. Farnsworth, S. R. C., to Ithaca, N. Y., reporting to the officer in charge of School of Military Aeronautics, Cornell University, for duty.

First Lieut. Daniel Jordan, S. R. C., reporting to the Military School of Aeronautics at Ithaca, N. Y.

The resignation of First Lieut. Sirman D. Marvil, S. R. C., has been accepted by the President.

First Lieut. Robert D. Hoyt, Av. Sec., S. R. C., on duty in aerial flights as from November 24, 1917.

Temporary Second Lieuts. Frank H. Whitlow and Albert G. Moon, Signal Corps, will proceed to Garden City, Long Island, N. Y., and report to the commanding officer, that place, for assignment to duty. The travel directed is necessary in the military service.



America's airmen must know their machine guns. Upon accurate shooting under fearfully adverse conditions depends whether America can make the air unlivable for the Kaiser's planes. Mere numbers without deadly accuracy will not do it. Cadets at the great American "Ground Schools" are given even more intensive instructions in machine gunnery than in wireless, aerial photography, engines, planes, theories of flight and tactics. The instructor above is shown explaining the construction of the machine gun to an interested class of cadets who appreciate full well the necessity of what they are learning.—Photo passed by censor.

First Lieuts. Rowland C. W. Blissley, Edward T. Comegys, Aug. L. Grimme, and Jarvis J. Offutt, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, Fort Worth, Tex., for assignment to duty.

First Lieuts. John T. Agar and Herman D. Southwick, Aviation Section, Signal Reserve Corps, are assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aviation depot, that place, for assignment to duty. The travel directed is necessary in the military service.

Second Lieut. William J. Henry, Jr., Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report to the commanding officer, that place, for assignment to duty. The travel directed is necessary in the military service.

First Lieut. Omar J. Blood, Aviation Section, Signal Reserve Corps, is assigned to active duty, and will report to the commanding officer, aviation depot, Garden City, Long Island, N. Y., for assignment to duty.

First Lieuts. Alexander H. Munroe, Earl S. Wallace, and John Stewart Weeks, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, post field, Fort Sill, Okla., for assignment to duty.

Second Lieut. Rene R. Studler, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, School of Military Aeronautics, Ohio State University, Columbus, Ohio, for assignment to duty.

First Lieut. William Wilds, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Garden City, Long Island, N. Y., for assignment to duty. The travel directed is necessary in the military service.

Second Lieut. Carlton Van Valkenburg, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Garden City, Long Island, cinnati, Ohio, Chillicothe, Ohio. The travel directed is necessary in the military service.

Maj. Eugene R. Lewis, Medical Reserve Corps, will proceed to the following-named places for duty in connection with physical examining units for the examination of applicants for the Aviation Section, Signal Corps, and upon completion of this duty will return to his proper station in the office of the chief surgeon, Aviation Section, Signal Corps, this city: Philadelphia, Pa., Pittsburgh, Pa., Cleveland, Ohio, Detroit, Mich., Battle Creek, Mich., Chicago, Ill., Rockford, Ill., Minneapolis, Minn., Des Moines, Iowa, Omaha, Nebr., Fort Riley, Kans., Kansas City, Mo., St. Louis, Mo., Indianapolis, Ind., Louisville, Ky., Cincinnati, Ohio, Chillicothe, Ohio. The travel directed is necessary in the military service.

Second Lieut. Walter A. Yates, Av. Sec., S. R. C., active duty at Portland, Oregon.

Second Lieut. John Henry Eisele, Av. Sec., S. R. C., active duty at Garden City, L. I., N. Y.

Temporary Second Lieut. Louis F. Dolen, S. C., to aviation camp at Morrison, Va., for duty.

Major Charles A. Drave, Sig. Corps, to Chief Signal Officer of the Army for duty.

Captain John D. Carmody, Ordnance Reserve Corps, appointed Major Signal Corps (temporary grade), with rank from November 24, 1917, and to report to commanding officer aeronautical general supply depot and concentration camp, Morrison, Va.

Capt. O. J. May, Av. Sec., S. C., to Chief Signal Officer of the Army for duty.

Harry Gantz, appointed to the grade Captain (temporary), Signal Corps, with rank from November 30, 1917, and to report for duty at Rockwell Field, San Diego, Cal.

Capt. Edwin S. George, Quartermaster Reserve Corps, appointed to same grade in Signal Corps (temporary), Regular Army, with rank from May 22, 1917. Captain George will remain on duty with the Signal Corps.

Capt. Harold H. Weeks, Av. Sec., S. R. C., to active duty on board at Washington, D. C., to examine applicants for commission in Aviation Section, Signal Corps Reserve.

Second Lieut. Raymond F. Weaver, Av. Sec., S. R. C., active duty, reporting to the commanding officer, engine repair depot, Signal Corps, Indianapolis, Ind., for assignment.

Capt. George L. Norris, Av. Sec., S. R. C., active duty, reporting to the Chief Signal Officer for assignment.

Second Lieut. Nathaniel H. Luttrell, Av. Sec., S. R. C., active duty at Selfridge Field, Mount Clemens, Mich.

Paragraph 62, S. O., No. 200, relating to Major Warren P. Jernigan, S. C., is revoked.

First Lieut. Robert Sedgwick, Jr., Av. Sec., S. R. C., on duty as member of board to examine applicants for commission to Av. Sec., S. R. C., at Washington, D. C.

Temporary Second Lieut. Monroe Hurt, S. C., to Garden City, L. I., N. Y., for duty.

Temporary Second Lieut. Guy W. Arnold, S. C., to Portland, Ore., for duty.

The appointment of First Sergt. Charles V. Ammons, Company F, 44th Infantry, to grade of Captain (temporary), Signal Corps, with rank from November 30, 1917, is announced. Captain Ammons to report to the Chief Signal Officer of the Army.

Temporary Second Lieut. James Snyder, S. C., to report to Camp Travis, San Antonio, Tex., for duty.

First Lieut. Herman W. Schulz, Av. Sec., S. R. C., announced as on duty in aerial flights from July 20th, 1917.

A board of officers consisting of Lt. Col. Nelson Gapen, Med. Corps, Capt. Harold Hathaway Weeks, Av. Sec., S. R. C., to meet at Washington, D. C., to examine applicants for commission in the Aviation Section, S. R. C.

Commissions Granted in Aviation Section

The following commissions have been awarded to members of the Aviation Section, Signal Corps:

Major—Nicholas Biddle, 302 Broadway.

Captain—Thomas Walkup, 222 West Fifty-ninth Street.

First Lieutenants—Allen W. Porterfield, Columbia University; Andrew R. Shiland, 149 Broadway; Thomas F. Wilcox, 52 Broadway; Charles W. Fowler, Yale Club; J. C. J. Strahan, Jr., 1107 Broadway; William F. Goulding, 40 East Sixty-second Street.

Special Orders 291-293

Second Lt. DeWitt F. Ottman, S. R. C., active duty, reporting to the Chief Signal Officer for assignment.

Second Lt. Massey Sanderson McCullough, S. R. C., to Selfridge Field, Mt. Clemens, Michigan, for duty.

Second Lt. Semans, Av. Sec., S. R. C., to Chief Signal Officer for duty.

Second Lt. Clifford Evans, S. R. C., to active duty at Morrison, Va.

Second Lt. Albert J. Hoffman, Av. Sec., S. R. C., to Chief Signal Officer for duty.

Lt. Col. Oliver D. Filley, Av. Sec., Sig. Corps, announced on duty in aerial flights as from Dec. 3, 1917.

First Lt. William H. Carruthers, S. C., to report to engine repair depot, Indianapolis, Ind., for duty.

Under the provisions of paragraph 41, Special Regulations No. 43, a board of officers to consist of Capt. Frank H. Nichols, Av. Sec., S. R. C., and Capt. William H. Roberts, Med. Res. Corps, is appointed to meet at Los Angeles, Cal., for the purpose of examining such members of the Officers Reserve Corps as may be ordered before it, with a view of determining their fitness for their duties in the Aviation Section, S. R. C.

First Lt. James White, S. C., to Chief Signal Officer for assignment.

First Lt. Charles M. Dickson, Av. Sec., S. R. C., to Chief Signal Officer for assignment to duty.

First Lt. George M. Heberer, S. R. C., to Ft. Sam Houston, Texas, for duty.

Major Roy C. Kirtland, Signal Corps, temporarily detailed in the Aviation Section of the Signal Corps, with rank of Lt. Colonel.

First Lt. Russel Stabler, Av. Sec., S. R. C., to proceed to Panama Canal Zone, for duty with the 7th Aero Squadron.

Second Lt. Frank A. Riley, Av. Sec., S. R. C., to Selfridge Field, Mt. Clemens, Michigan, for duty.



The men shown are Air Service cadets at one of the "Ground Schools" busy taking their machine guns apart and becoming familiar with every detail before re-assembling them. In addition to the actual guns upon the tables the instructor may be seen drawing diagrams and preparing a blackboard lecture on the subject. Shortly all the men will be given actual practice in marksmanship outside. They will also study with equal care radio, aerial, photography, codes, reconnoissance, and bombing.—Photo passed by censor.

Second Lt. H. N. Schofield, Av. Sec., S. R. C., to duty at Portland, Oregon.

First Lieutenants William W. Blake and Stanley F. Hauser, Av. Sec., S. R. C., active duty at Greenville, South Carolina.

Major William N. Hensley, Jr., Av. Sec., S. C., on duty in aerial flights from Nov. 22, 1917.

Temporary First Lt. John H. Wade, S. C., to Chief Signal Officer for assignment.

First Lt. William G. Garrett, Jr., Av. Sec., S. R. C., to Chief Signal Officer for assignment to duty.

Captain Edwin S. George, Sig. Corps, to Chief Signal Officer for assignment.

Major Charles E. Livingston and Captain Valentine Murray, Infantry Res. Corps, to commanding officer, Signal Corps Detachment. Camp Hancock, Augusta, Ga., for assignment to duty.

Captain Cleveland L. Waterbury, S. C., to Hazlehurst Field, Mineola, L. I., N. Y.

The promotion of Captain Carl M. Tichenor, Signal Corps (temporary) to the grade of Lieutenant Colonel, Signal Corps (temporary) with rank from Dec. 12, 1917, is announced.

First Lt. George H. Dekay, Av. Sec., S. R. C., to Chief Signal Officer for duty.

First Lt. Charles A. Muller, Av. Sec., S. R. C., to Hazelhurst Field, Mineola, L. I., N. Y., for duty.

First Lt. Leo F. Powers, Av. Sec., S. R. C., to duty at Taliaferro Field, Hicks, Texas.

Second Lt. Joseph P. W. Arnold, Av. Sec., S. R. C., to active duty at Portland, Ore.

Second Lt. George W. Hill, Signal Corps, to Chief Signal Officer for duty.



Majors Decker, Campbell and Banning of the Aviation Section.—Photo passed by censor.

THE CONTINENTAL PUSHER BIPLANE



THE Continental Aircraft Corporation's model "K. B.—1" biplane is one of the most original and successful of pusher types to be developed in the country. The short overall length is noteworthy, and the tail works have been found especially responsive, in spite of their nearness to the main planes. It will be seen that, although the observer is situated well forward of the planes, the length of the machine is no greater than the average tractor aeroplane.

An unusual feature of this pusher is in the fact that it will fly with apparently as good balance without the observer in the forward cockpit. The nacelle is very compact, but the accommodations are adequate and comfortable. The many constructional details are interesting and neat and the finish conforms to the best practice. The model K.B., designed by Vincent J. Buranelli, is the first type turned out by the Continental Company.

General Specifications

Span, upper plane	36′ 0″
Span, lower plane	36′ 0″
Chord, both planes	5′ 3″
Gap between planes	5′ 3″
Overall length	22′ 0″
Overall height	10′ 3″
Weight, empty	1500 lbs.
Weight, loaded	2600 lbs.
Motor, Hall Scott	135 H.P.
Air endurance	4 Hours
Speed range	95-55 m.p.h.

Planes

The USA-5 wing curve is used. Planes are set with an incidence angle of only 1½ degrees. There is no stagger, sweepback nor dihedral to the planes. Upper and lower planes have the same spread and the same shape, with ailerons on both.

A two-foot panel is carried on struts from the nacelle with a main wing panel at each side. Lower plane in two sections, attaching near the lower side of the nacelle.

Struts are of constant section, curved to square ends to fit into the socket. Landing cables are single stranded wires, and flying cables double. Flexible cable used for all control wires and control surface connections.

Ailerons are 8′ 6″ long and 1′ 6″ deep. Where ailerons are hinged, the rear main wing beam is bevelled, and a bevel on the aileron permits the surface to be altered without leaving a space between aileron and wing. Aileron pulleys are set in the plane in a housing covered by transparent sliding inspection doors, and cables are run on the interior of the planes.

Nacelle

The monocoque body or nacelle is 2′ 8″ wide and 3′ 3″ deep. Overall length, from nose to tip of propeller cap, 12′ 5″. The framework of the body is veneer, and the outside formed with two-ply mahogany veneer. The motor is carried on heavy veneer panels in such a way that the motor is easily removed from the body by sliding it out at the rear.

To streamline the body an aluminum propeller cap, 2′ 8″ in diameter at its forward end, closes in the rear, attached to and revolving with the propeller.

The pilot's cockpit, just forward of the main planes, is provided with a Dep wheel-control and foot-bar. The usual instruments are carried on the dashboard. The pilot's seat is hinged at its front end and may be lifted to gain access to the starting crank so the pilot may start the motor from the cockpit.

At the front of the nacelle the observer's seat is mounted on a swivel. A dashboard, for instruments or maps, is located in a convenient position. Small but effective wind shields are placed before both the observer and pilot, and both cockpits and rims are finely upholstered in red leather.

Tail Group

The empennage is carried on a pair of steel tube outriggers 3″ in diameter. The forward end is carried on a built-up strut of triangular shape. Extra heavy double cables support the outriggers at the rear, running from the top and bottom of the outrigger struts. The outriggers are spaced 12′ 0″ apart and each is 10′ 9″ in length.

The tail plane is 2′ 0″ wide. Attachment to the outriggers is made at the tail plane front beam located 6″ from the leading edge of the plane.

Tail flaps or elevators are the same depth as the tail plane. They are hinged with a bevelled spar, leaving no gap between the hinged surfaces. The same applies to the rudder attachment to the vertical fin.

The dart-shaped fin surface is divided equally above and below the tail plane to which it is attached. It is braced to the outriggers by light cables. The vertical rudder is 2′ 0″ wide and 5′ 0″ in maximum height. Streamlined sheet steel control tillers are used.

Landing Gear

Four wheels and a pair of skids are used on the chassis. Skids are spaced 4′ 6″ apart. Forward wheels are 20″ by 3″, and have a 5′ track. Rear wheels are 26″ by 4″, with a 5′ x 5″ track. Both axles are bound to the skid with elastic shock-absorber cord, with the axles running in sheet steel guides.

Connections between chassis members and between chassis struts and the nacelle are made with heavy gauge sheet steel plates, bevelled and drilled for appearance and lightness.

The landing gear structure is braced with heavy stranded cable. The rear ends of the skid are bent downward and provided with steel spurs at their tips, which by tilting the machine back on them, plow into the earth to check rolling on the ground.

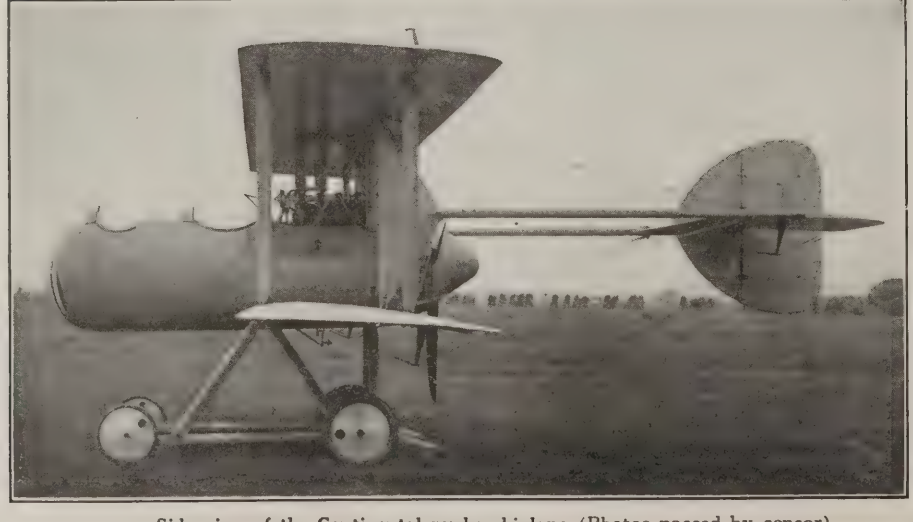
Engine Group

The engine is a Hall-Scott A5a rated at 135 H.P. at 1300 r.p.m.

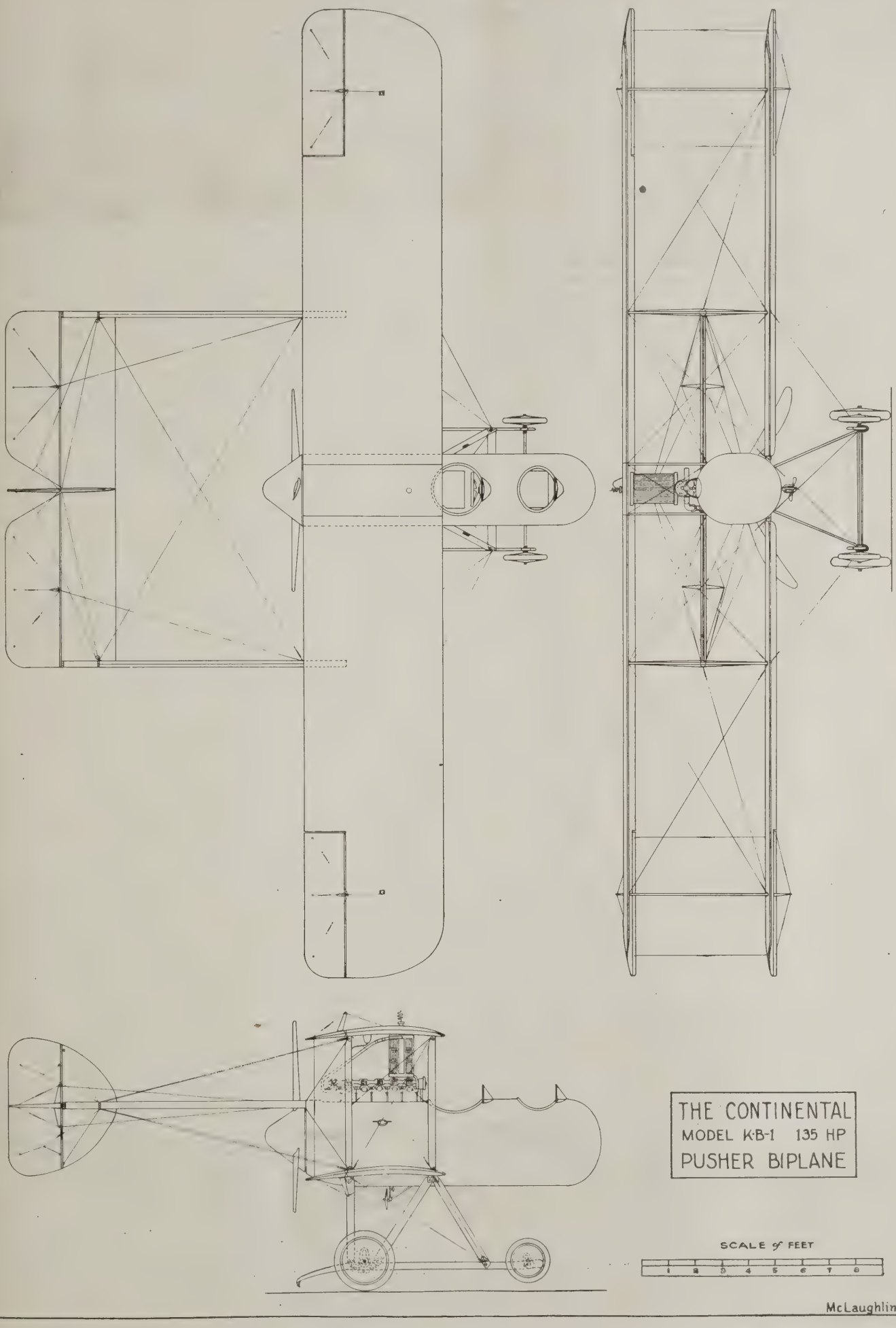
A three-bladed Paragon propeller is used at the present time. The outriggers are spaced far enough apart so that a two-bladed propeller of greater diameter may be used

Two fuel tanks, having a total capacity of 45 gallons, are fitted at either side of the motor. A five-gallon oil tank is used. A 4-gallon copper service or gravity tank is built into the upper central wing panel, conforming to the outline of the wing section. It is kept filled at a constant level by the action of a small wind-mill operated gear pump located under the nacelle. Fuel is carried for a duration of 4 hours. Filler caps on the sides of the nacelle facilitate filling the main tanks.

An Ajax radiator is mounted over the two forward cylinders of the engine. It weighs 72 lbs. empty and has a capacity for 8 gallons of water.



Side view of the Continental pusher biplane (Photos passed by censor)



(Drawing passed by the censor)

MAGNETO IGNITION*

I.—A Simple Explanation of the Fundamental Principles.

WHATEVER basis of truth there may be in the ancient Greek legend that the powers of the magnet were discovered by Magnes—the young slave of Medea—finding himself held fast by the iron nails which were under his shoes as he walked over a lodestine mine, the fact remains that the electrical properties of the magnet have come to play a vital part in propelling the swiftest vehicles which man has so far invented.

To the uninitiated the high-tension magneto may appear to be "a box of tricks," but it is in reality a wonderful piece of mechanism—how wonderful can only be realized when it is remembered that it is called upon to produce something like 5,000 separate and distinct sparks every minute, each one of those sparks having to occur at a certain, definite time. How well it performs its task is shown by the scant notice it usually receives, and many people were frankly surprised that such an insignificant looking fitting should have been deemed worthy of having a whole paper to itself during the last session of the Aeronautical Society. That paper was taken up mainly with the scientific and technical aspects of the design and manufacture of magnetos; it is with quite a different purpose that these notes are written—it is hoped that they will enable those who have to deal with magnetos in the course of their work to understand something of the why and wherefore of the apparatus.

"What is electricity?" is a question which is often asked, and it is one by no means easy to answer in such a way to be understood by the people. An easier question, and one which to a certain extent covers the other, is: "What makes the electricity?" To that the answer is simple. There is no need to make it for it is always ready to our hand. We live in an electrical world, with electricity existing passively in everything. We learn from scientists that the atoms, which build up all things, are composed of two different sorts of corpuscles—or electrons—one sort being called positive, while the others are termed negative. In the ordinary course they neutralize one another, and if we want to utilize

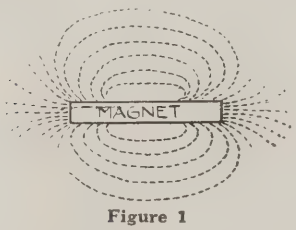


Figure 1

the electricity it is necessary to separate the positive from the negative corpuscles when a current will be caused.

It is, however, easier to set electricity in motion in some substances than in others. In copper and most metals, for instance, the corpuscles can move without much difficulty and they are known as conductors. In cotton, air, India rubber, etc., there is great resistance, and they are known as non-conductors, or insulators.

Here it may be pointed out that there is a great difference between electricity and a current of electricity. The distinction may be made clear by an analogy. We live surrounded by the atmosphere, but normally we are unaware of its presence until there is a change in the conditions when, pressure being brought to bear, at a certain place a wind is caused, which we feel. Similarly the electricity, which is in everything, remains unnoticed until it is set in motion.

There are several ways of setting it in motion. One simple method is to rub with a piece of flannel a stick of amber, sealing wax or other similar substance, when it will be found to have acquired the power of being able to attract to itself small pieces of paper. This phenomenon was observed by the early Greek philosophers, and the word electricity is, in fact, derived from the Greek word for amber.

An electric current can also be produced, this time by chemical action, if certain materials, such as zinc and carbon, are connected by a piece of wire and then immersed in a solution—in this case salammoniac and water. The resultant chemical changes will cause a current to flow in the wire and this is, in simple terms, what is known as the wet battery, commonly used for the household electric bell. Another form of much the same thing is the popular dry cell used for a similar purpose, as well as for portable lamps and other things where only a small amount of current is required.

A third method of exciting an electric current is by utilizing the properties of the magnet, and this is the one we are concerned with.

*Courtesy of "Flight," London.

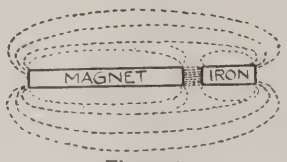


Figure 2

Before proceding to describe the actual mechanism used to produce the spark, it may be as well to consider the characteristic features of a magnet. There are two classes of magnets: one known as permanent magnets, which are either pieces of magnetite (the lodestone of the ancients), or hard steel, which has had the magnetic properties imparted by being brought into contact with another magnet. The second class of magnet—generally called an electro-magnet—usually consists of an iron core surrounded by a coil of wire, and it only becomes a magnet when a current of electricity is flowing through the wire. For the moment, however, we need only consider the permanent magnet, usually made of tungsten steel, *i. e.*, a steel which has had a certain amount of tungsten incorporated in it for hardening purposes.

If a bar magnet is taken and some iron filings are sprinkled around, it will be found that the filings will cluster at either end, none being attracted to the middle. This shows that the magnetic power is strongest at the ends, hence they are called the poles, while the centre of the bar is known as the neutral portion. If a bar magnet is cut into pieces each becomes a complete magnet with its poles at either end. Also a piece of soft iron when placed a short distance from one of the poles will take on the characteristics of the magnet, only to lose them again when it is withdrawn from the magnet.

Another way of demonstrating this peculiar property of the magnet is to lay a piece of cardboard upon it and sprinkle the iron filings thereon, when they will be found to arrange themselves in certain well-defined lines, as shown in the diagram, Fig. 1. The arrangement is facilitated by lightly tapping the cardboard so as to vibrate the iron particles. If a piece of soft iron is now placed in the vicinity of one of the poles (see Fig. 2) it will virtually form an extension of the magnet, a great many of the magnetic lines crowding into the iron and transforming it for the time being into a magnet.

A horse-shoe magnet, which, after all, is only a bar magnet bent so as to bring its poles opposite to each other, can be experimented with in the same way, and it will be found that the magnetic field is mostly confined to the region between the poles, as shown diagrammatically in Fig. 3.

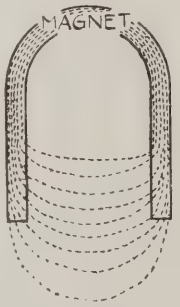


Figure 3

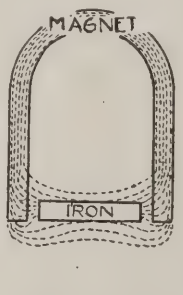


Figure 4

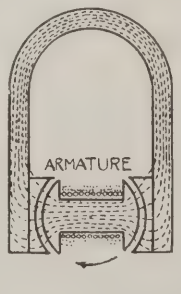


Figure 5

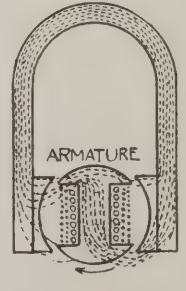


Figure 6

If the piece of iron is placed between the poles most of the magnetic lines of force will pass into the iron, as shown in Fig. 4. As is well known, one pole of a magnet always tries to point to the north—a quality which is taken advantage of in the compass—and that is usually referred to as the north pole. The magnetic lines of force always flow from the north to the south pole, so that if the iron is rotated it will be magnetized, demagnetized and remagnetized continually.

It has been pointed out that if wire is coiled around an iron core and a current of electricity is sent through the wire the core will become a magnet. The reverse is likewise the case; if a magnet is passed through a coil a current of electricity can be induced in the wire. This is because the influence of the magnet extends to the space surrounding it, called the magnetic field, and this influence as it passes through the coil of wire separates the positive from the negative corpuscles in the copper wire, thus setting the electricity in motion. If the piece of iron, after having a coil placed around it, is rotated between the poles of the magnet, a current of electricity will be found flowing through the wire, for the iron, although not a magnet itself, being alternately magnetized and demagnetized, provides exactly the same effect as though a magnet were being continually passed through the coil.

To take advantage of this fact, in the magneto the poles of the magnets are fitted with pole-pieces—pieces of iron with the inside face forming the segment of a circle—while the ends of the armature—a sort of shuttle carrying a coil and corresponding to the piece of iron used in the earlier experiments—are so shaped as to leave just sufficient clearance between it and the pole-pieces when it is being rotated. This arrangement is shown in Fig. 5.

Here the magnetic lines of force are observed to be passing through the centre of the armature and the coil, taking the shortest cut from pole to pole. When the armature is turned the magnetic lines are stretched until the position

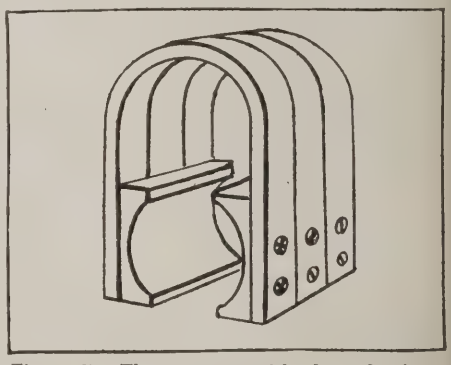


Figure 7. The magnets with the pole-pieces in position

shown in Fig. 6 is reached. As the armature reaches this position the greater part of the lines are going from the north pole of the magnet through the uppermost part of the armature and down the coil to the south pole, but some are making their way straight across. As the armature passes this point the magnetic lines divide, one-half going through the top of the armature and the other half through the bottom, without passing through the coil. Then the electrical impulse is at its maximum intensity, as the wire of the coil has "cut" through all the lines of magnetic force. Immediately afterwards the magnetic lines commence to flow through the coil in the reverse direction, going in through the bottom part of the armature and out at the top. This gradually increases until the zero position is reached, when the magnetic lines are all going through the coil again.

It is when the wire is cutting the magnetic lines, or, in other words, passing through the magnetic field, that the current of electricity is generated. The faster the coil cuts the lines the greater will be the pressure—or voltage—of the current generated. When the armature is in the position shown in Fig. 5, the coil is, as it were, sliding along the lines of force and not cutting any; consequently that is known as the "zero" position. When the coil is cutting the lines at the greatest rate is when it is moving at right angles to them, and that is when the armature is passing the vertical, as in Fig. 6, which is known as the maximum position. Between its zero and maximum positions the coil is only cutting the lines diagonally, and consequently the rate at which they are being cut is slower than the maximum. During the whole of the time the armature is passing from the horizontal to the vertical position there is a steady rise in the voltage from zero to maximum, and then it falls back to zero as the armature approaches the horizontal again.

It will thus be seen that the current of elec-

tricity is not a steady, continuous flow, but is in the nature of a series of surges or impulses, two of which—one in each direction—are obtained during every revolution of the armature. It is possible to obtain four impulses in each revolution by having a stationary armature and revolving a sleeve between it and the pole-pieces, but that will be explained later.

Having reached this point and seen how the current of electricity is generated, reference may

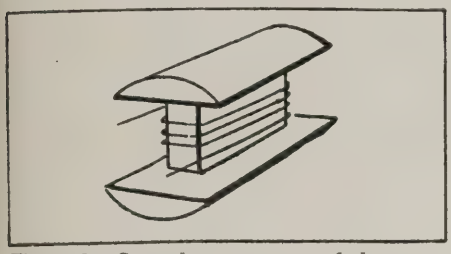


Figure 8. General arrangement of the armature with three turns of the wire arranged on it

be made to the way in which it is measured. For this purpose the electric current may be compared to a stream of water, although the analogy—like all analogies—is not rigorously true. The *quantity* of electricity, corresponding to gallons of water, is measured in coulombs, a name which commemorates the French physicist, Charles Augustin Coulomb. The *current*, in coulombs per second (corresponding to gallons per second) is measured in amperes, or more simply amps., which perpetuates the work of another Frenchman, André Marie Ampère, who among other work in electro-dynamos, demonstrated the relations betgeen magnetism and electricity. The ohm, named after a German professor, is the unit of electrical resistance, corresponding to the resistance of pipes to the flow of water while the unit of *pressure* (or E.M.F.) is the volt, an abiding memorial of the work of the Italian physicist, Count Alessandro Volta, who invented several electrical instruments. This unit corresponds to pounds per square inch, or feet of head-water pressure, in the water analogy. Just as when the pressure or head is increased more water will pass through a given pipe per second, so by increasing the voltage more electricity flows through a given wire per second. Conversely, if the size of the pipe is increased and the pressure remains as before more water passes, so, in the same way, if the resistance of the wire is reduced more electricity passes.

II.—The General Arrangement of H. T. Magnetos.

The use of a spark generated by a magneto machine for igniting the charge in an internal combustion engine is a great deal older than most people imagine. As early as 1870 a German engineer was experimenting with a low-tension magneto, and he certainly obtained patents for a magneto electric ignition gear in 1883. Four years later, Bosch commenced the manufacture of what is known as the oscillating armature type of magneto for large, slow-running gas engines.

Some of the earliest motor cars were fitted with low-tension magneto electric ignition, but the troubles experienced with it were even worse than those which were a concomitant of hot tube ignition which won the race for popular favor for a time. Then, improvements having been made, the low-tension magneto came into its own again, only to gradually give way and eventually be superseded almost entirely for motors by its high tension rival. In view of the widespread use of the high-tension magneto nowadays, it is interesting to look back to the time

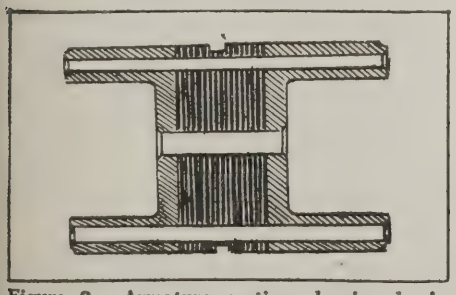


Figure 9. Armature section showing laminated centre

when the relative advantages of the two systems were strenuously debated whenever motorists foregathered, as well as forming a controversial topic, which led to the easy filling of many columns in the correspondence pages of the motor press.

From what has been said in the previous chapter it will be apparent that the two main parts of the magneto are the magnets and the armature. The former, of which in the early types there were as many as six, are usually of the horse-shoe type. Now they rarely exceed three in number, arranged side by side; in some cases two are used, while in a few instances one broad magnet is deemed sufficient. The general arrangement is as shown in Fig. 7, where the soft iron pole pieces are shown in place.

The general shape of the armature, the shuttle or bobbin on which the coil is wound, is seen in Fig. 8. It is not, however, made in one solid piece, and if it were cut through the centre it would be seen that there were two end pieces, with the middle portion made up of thin sheet-iron stampings or laminations, each one with a coat of varnish to insulate it from the next. This is done because the effect of a solid armature revolving in the magnetic field between the poles would be to set up eddy currents in the iron, as shown in Fig. 9.

On the armature is wound the coil of copper wire covered with silk or other insulating material. There are in point of fact two coils, one inside the other, the inner one consisting of a comparatively few turns of thick wire, while the other is of finer wire and has a great many turns.

It has been pointed out that if an electric current is sent through a wire it creates a magnetic field in the space surrounding it. This field of influence can not be utilized to transform a core of iron into a magnet, but it will also cause a current of electricity to flow in another piece of wire brought within its influence.

So if a coil is placed inside another and a current of electricity is sent through one, a current will be caused to flow in the other even although there is no actual connection between the two coils. This is known as mutual induction. Further, if the wire of the second coil is thinner than that of the first the voltage of the induced current will be higher than in the case of the current generated in the first coil. This fact is taken advantage of by the H. T. magneto and accounts for the two coils.

It is common knowledge that electricity while it is in motion must follow a circuit; if that circuit is broken the pressure of the electricity will mount up, and if it is allowed to become sufficiently high, the current will break its way through the gap in the form of a spark. The current generated by a low tension magneto is not sufficient to jump across the points

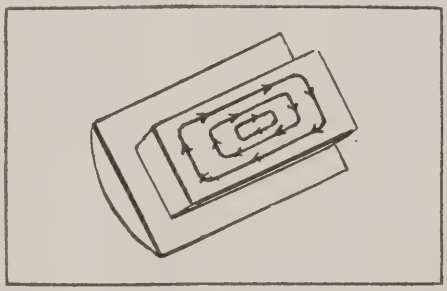


Figure 10. Cross section of an armature, showing diagrammatically the eddy currents which would be set up if the armature were solid

of a sparking plug, and when magnetos of this type are used for ignition purposes it is necessary to fit a device inside the cylinder which will "break" the circuit and so produce the spark at the precise moment it is required.

Electricity, like everything else when in motion, possesses momentum, which means that it takes a certain period of time to bring it to rest. That is why if a circuit, in which electricity is moving, is suddenly broken the electricity accumulates at the break.

This momentum is utilized in another way to increase the voltage of the H. T. current. Ordinarily the low tension circuit is complete in itself, but it is connected with what is called the low tension contact breaker, a little trigger mechanism which, when the current is at its strongest—about 40 volts—breaks the circuit and so diverts this current into the high tension circuit, where there is a voltage of about 6,000 volts. The result is to force the latter voltage to 10,000 to 15,000 volts, which is sufficient to cause the current to jump across the points of the sparking plug.

Here it may be as well to point out how the armature is fitted up to do its work. Across the ends of the armature are fastened plates carrying spindles which are mounted in bearings in fittings which go across the ends of the pole-pieces. Generally one spindle carries the low tension contact breaker, while on the other is a ring, connected to the high-tension coil,

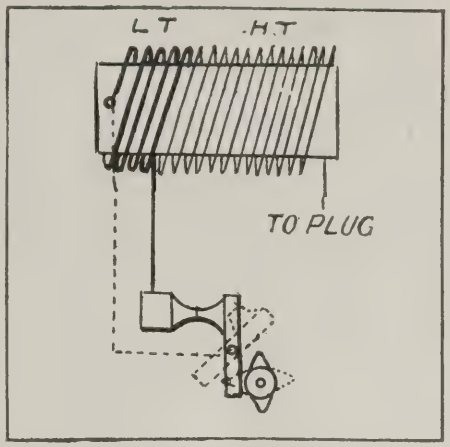


Figure 11. Diagram showing the arrangement of the low and high tension coils and the contact breaker, which, by breaking the L.T. circuit, shunts the current into the H. T. coil

from which the high-tension current is collected and sent to the distributor, a revolving fitting which selects the cylinder in which the spark takes place.

Between the ring and the distributor there is arranged what is termed the "safety gap," which is in effect a safety-valve in case, for any reason, the electricity should be unable to get across the points of the sparking plug. In that event, the electricity congesting in the wires would set up great heat and be likely to burn away the insulation in parts and thus ruin the magneto. This "safety-gap" merely consists of two points—connected by a bye-pass on the circuit and sufficiently far apart not to allow the current to jump across in the ordinary way.

Another important fitting in the magneto is the condenser, which is arranged in the low-tension circuit. When a circuit is suddenly broken there is a liability of a spark to be formed, and if that were allowed in the contact breaker the great heat generated would soon burn away the points, rendering them useless. It is the object of the condenser, then, to prevent this, and it does it by absorbing the momentum of the electricity.

Condensers are made of sheets of tinfoil separated by pieces of mica, or paraffined paper. It will be noticed that the pieces of tinfoil are not of regular oblong shape, but have one corner cut off, while the insulators have both corners cut off. Every alternate piece of tinfoil is placed with one corner sticking out on the right. If, then, the corners on one side are connected together and those on the other side are likewise connected, it will be seen that there is an equivalent of two large sheets of tinfoil, seperated by an insulator connected to the circuit. The result is that when the circuit is suddenly broken the electricity, seeking another way round, takes what seems a promising "short cut," into the tinfoil, where its momentum is expended in charging the sheets. As soon as the sheets of tinfoil are charged, the arrival of more and more electricity simply adds to the resistance, acting very much in the same way as the buffer stops in a railway terminus do in bringing a slow-moving train to rest.

(To be continued)

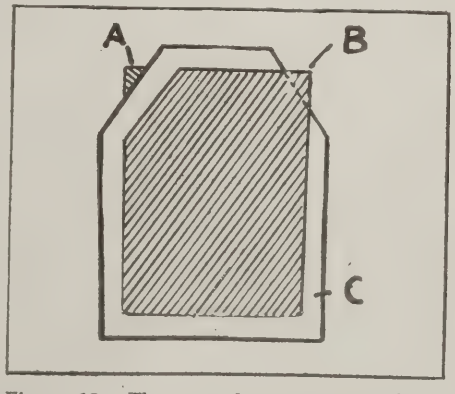


Figure 12. The general arrangement of the condenser. A, the overlapping corners of one set of tin-foil sheets; B, the corners of the alternate sheets; C, the insulating material between the sheets

SOME NOTES ON ELECTRICAL DYNAMOMETER INSTALLATION

By L. A. WILSON*

THE progress of the automobile and aeronautic industries has been largely responsible for the development of the electrical dynamometer, for nearly all of such machines in commercial use at the present time are used in connection with engines. The advantages of this form of power measuring machine over other types are numerous and decisive, particularly in its adaption to the testing of motor car equipment. As a means of loading the engine and determining at a glance the power developed, it is superior in every way to the Prony brake, the hydraulic brake and the fan dynamometer. Carburetor and magneto manufacturers have found it to be an indispensable part of their testing equipment.

Some of the principal advantages of the electrical dynamometer are: Accuracy, convenience of operation, steadiness, wide speed range, heavy braking torque at low speeds, and being equally suitable for transmitting or for absorbing power. As a transmission dynamometer, it operates as an electrical motor, and as such it is very convenient for starting

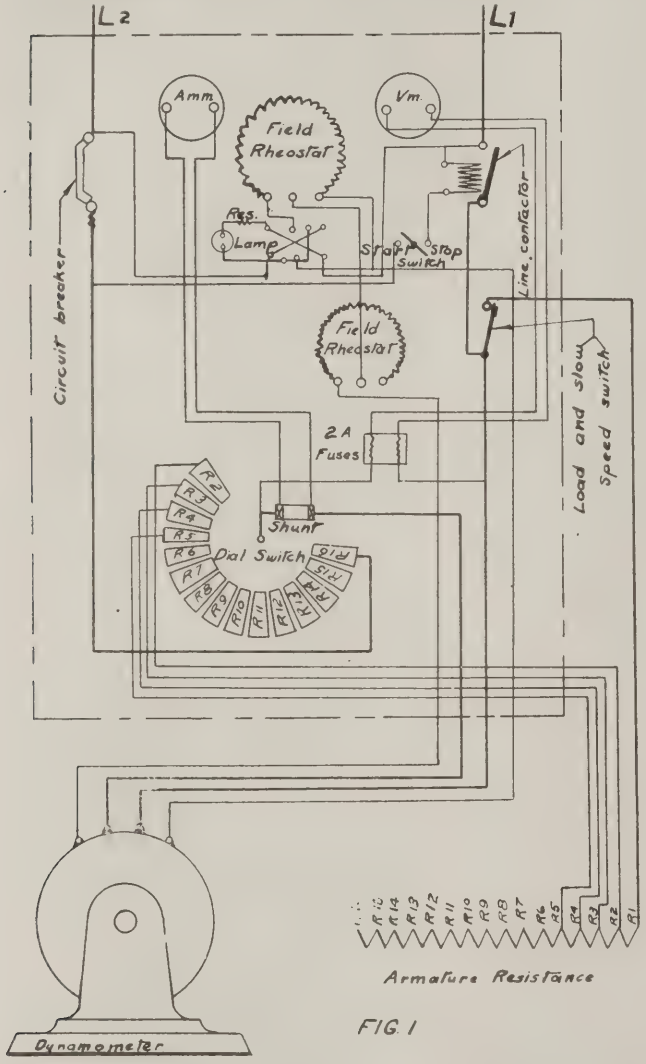


FIG. 1

the engine or for running friction tests. In other applications it might be useful for testing belts, gears, pumps, fans, etc. When operating as an absorption dynamometer, i. e., as a generator, the power of the engine is converted into electrical energy, which may be utilized in the shop or dissipated by suitable resistances. Water rheostats and lamp banks are used to some extent as resistances, especially on temporary jobs; but for continuous service the water rheostat requires too much attention besides being bulky and unsightly. Lamp banks are unsatisfactory from the standpoint of upkeep.

As a permanent fixture, the most satisfactory arrangement consists of cast-iron grids properly assembled and connected, and spaced to allow free circulation of air. Such resistance frames may be set up in any convenient place, sheltered from the weather and when warmed up to the working temperature they will furnish absolutely constant resistances without a bit of attention.

The writer recently had charge of the installation of an electrical dynamometer for general testing purposes in an experimental laboratory, where it was desired to have an outfit capable of being used either as an absorption dynamometer for testing automobile and aeroplane engines, or as a transmission dynamometer for belt testing, etc. The machine was purchased under the fallacious supposition that it could either absorb or transmit practically the full rated power, which, of course, is an impossibility because the efficiency of conversion increases

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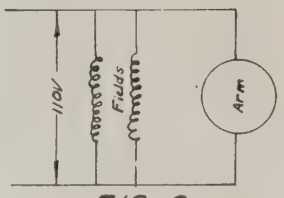


FIG 2a

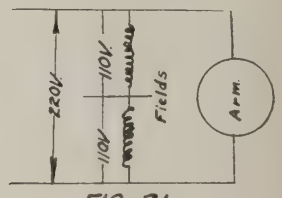


FIG 2b

the capacity for power absorption and decreases the capacity for transmission. Other conditions being favorable, the electrical dynamometer will absorb about 25 per cent. more power than it can transmit.

During the process of wiring-up the outfit under discussion, it was discovered that the specifications called for much smaller wire for current supply than would ordinarily be used to carry the full rated current of 400 amperes. Further investigation revealed the fact that the "line contactor" was designed for only 150 amperes, and the circuit breaker for 200 amperes. The accompanying diagram of connections, Fig. 1, shows the relative position of these two contactors; they function only when the machine is operating as a motor, hence their limited capacity does not affect the maximum power of the machine as an absorption dynamometer, but reduces the safe *transmitting* capacity to less than half the normal rating of the machine. The explanation offered by the manufacturers for this apparently senseless arrangement was that most of the equipments had been sold to the automobile industry for testing gasoline engines and because of the nature of that work no question had ever been brought up regarding the capacity of the machine when used as a transmission dynamometer, the reason being that the friction losses in such cases never exceed 20 or 25 H.P.

Now, regarding the dynamometer itself, the armature is wound for 220 volts, but the fields were designed for separate excitation at 110 volts. With this arrangement, the practical speed range is considerably greater than would be possible with a 220 volt field, which is obviously an advantage where the testing of engines is the primary function of the dynamometer. But if it is desired to operate as a motor under such conditions, the maximum capacity is limited to less than half of the rated capacity, because of the voltage being only half as much and the efficiency of the motor entering in as an important factor.

As a basis for rough calculations, let us arbitrarily assume an efficiency of 90 per cent. Considering first the case in which the machine acts as an electrical generator operating at 400 amperes (rated capacity for continuous operation), we get, from fundamental considerations,

$$\frac{400 \times 220}{746 \times .90} = 131, \text{ horsepower absorbed.}$$

On the other hand, if we operate the dynamometer as a motor, the pressure of the current supplied is only 110 volts, while the current capacity of the armature is limited as before to 400 amperes. We can then put into the machine only: $\frac{400 \times 110}{746} = 59$ horsepower,

and if the efficiency of the motor is 90 per cent, the amount of power that can be transmitted is: $59 \times .90 = 53$ horsepower, which is less than half of the capacity of the same machine running as a generator absorbing power.

The apparatus, thus limited in its usefulness, was not satisfactory for general laboratory purposes without modification. As to the changes that were made.—In the first place, it was found undesirable to change the 220 volt armature for a 110 volt winding. While this would have permitted increased capacity as a motor at high speed, the low speed characteristics would have been unsatisfactory because of the necessity of utilizing armature resistance control of the speed. The effect is evident when one considers the fact that increasing armature resistance results in decreasing the voltage and current, which together with the drop in speed greatly reduces the available power of the machine. Consequently, the capacity at low speed would have been far below normal rating. Furthermore, the operating losses are much greater when regulation is accomplished by means of armature resistance, and it is a question whether much would have been gained by this arrangement. From an economical standpoint, as well, the higher voltage was more desirable.

The next consideration, after deciding to use the 220 volt armature, was that of supplying 220 volt current instead of 110. To make this feasible, it was proposed to connect the field coils in series, Fig. 2 (b), in place of the original parallel arrangement, so that there would still be the same voltage drop across the fields. This would reduce the copper cost to a minimum, and at the same time double the maximum

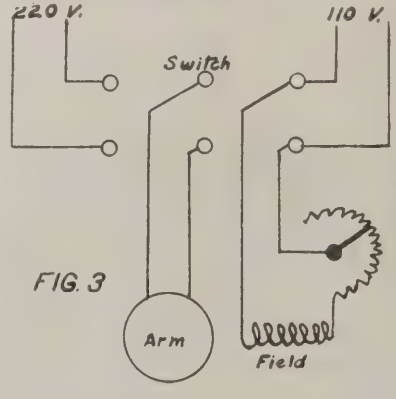


FIG. 3

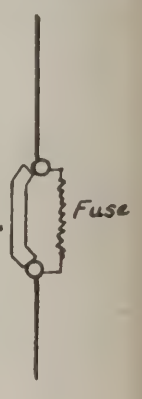


FIG. 4

capacity as a motor; but this scheme is open to the same objection mentioned in the preceding paragraph namely, the speed range is limited to the higher speeds that make it unsatisfactory for testing engines and other apparatus where a wide variation of speed is requisite.

From those considerations, it became evident that the best arrangement for all purposes would evolve from some sort of a compromise. This was effected by carrying two sources of current to the control

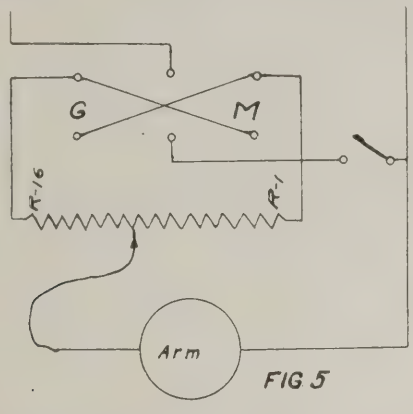


FIG 5

panel, one 110 volt and the other 220 volt, with connections to a double throw switch as shown in Fig. 3. By means of this switch the armature circuit can be connected to the 110 volt supply. For testing engines, then, or when it is desired to operate at slow speeds, the switch is closed onto the 110 volt line; but the maximum capacity for continuous operation is limited to about 60 H.P. If more power is required, it is only necessary to throw the switch over to the 220 volt line, but in that case the normal speed of the machine becomes twice as great and the practical operating range limited to the higher speeds.

The following changes were required at the control panel: The line contactor was replaced by one of 500 amperes capacity. A 300 ampere fuse was shunted around the 200 ampere circuit breaker, as in Fig. 4, to assist in taking care of the full load capacity and at the same time furnish additional protection against excessive current. An additional double throw switch was installed, with connections according to Fig. 5. The necessity for this was occasioned by the resistance grids having been laid out for the limited conditions of application to the automobile industry, as previously mentioned. Fig. 1 shows the original wiring diagram, from which Figs. 6 (a) and 6 (b) are produced to show in simplified form the arrangement of the armature and resistance when operating as a motor and as a generator, respectively. The fields, not shown in the two simplified sketches, are the same for both conditions, i. e., connected in parallel and separately excited from the 110 volt source. From Fig. 6 (b) it is clear that when the armature resistance is all cut out except the single section labelled R-1, that section will then be subjected to the maximum current that can be imposed upon the resistances, and it must be large accordingly. When R-2 is in series with R-1, the additional resistance furnished by R-2 cuts down the current that can flow through the armature and resistances, and R-2 can, therefore, be that much smaller than R-1. For the same reason, R-3, R-4, etc., are smaller and smaller, and R-16 is the smallest. Now, referring to Fig. 6 (a), which shows connections when operating as a motor, the maximum current carrying grid could be R-16, the smallest in the preceding case. Thus the function of the additional switch becomes apparent. It serves to "turn about" the resistance connections so that resistance is cut out from R-1, just as in the preceding case, thereby making the resistance frames suitable up to full capacity for motor as well as generator, and also, keeps the cost of wiring at a minimum. The sizes of wires used to connect the dial switch on the control panel to the various sections of the resistance can be gradually decreased from a maximum at R-1 to a minimum at R-16, whereas in the arrangement as usually applied to the automobile and aeronautic industries and as originally intended in the case under discussion, the size of wires from R-5 and intermediate points down to R-16 was specified the same, namely, No. 0000, which is large enough to carry about 200 amperes. This, then, would have been the limiting capacity when operating as a motor. On the other hand, the switch arrangement

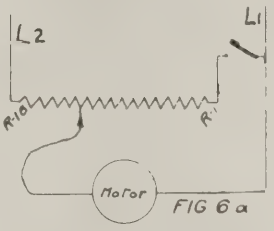


FIG 6a

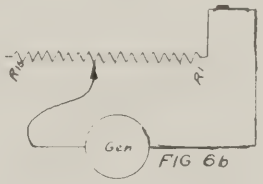


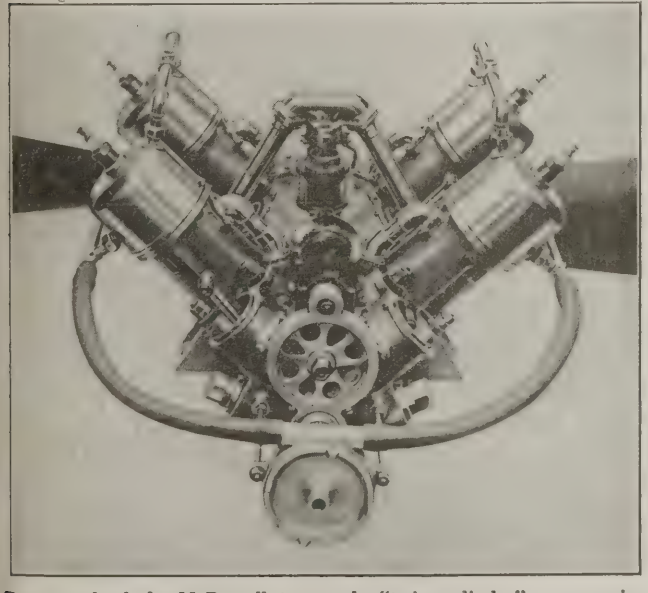
FIG 6b

described enables the operator to always cut out resistance from the R-1 end, and the required carrying capacity of the grids and connecting cables follows a decreasing scale to a minimum at R-16. As a precaution against damage from accidentally starting with this switch the wrong way, a fuse of small capacity is provided in the R-16 connection.

THE McDOWELL TWIN-CYLINDER AEROPLANE ENGINE

A TWO-CYCLE aeroplane motor of unique design has recently been tried out on a test stand, and is soon to be installed in an aeroplane for its flying test. The working principles are patented by Mr. Geo. McDowell of Brooklyn, N. Y., who has incorporated in its design some ideas and refinements which are new to two-cycle practice.

The McDowell V-type model has four cylinders with copper water-jackets surrounding the combustion chamber. Slots at the bottom of the stroke release the burnt gas. At either side of each cylinder is a small cylinder which is used to compress the gas before it is led to the power cylinder. The accompanying illustration shows how slots are run in the cylinder wall with a pin connecting the piston to the small auxiliary connecting rods which work the small compressing pistons when the power piston moves. By this method, only two strokes of the piston are necessary to obtain the effect of a four-stroke cycle. The inventor claims a great saving in fuel, an appreciable reduction in weight, and the elimination of a number of trouble-making parts which are often found in four-cycle motors.


Pump end of the McDowell two-cycle "twin cylinder" aero engine.

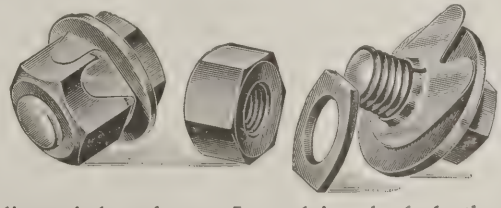
Besides the stationary model, Mr. McDowell has designed a radial rotary motor based upon the same principle, which is expected to attract a good deal of favorable attention.

The Shekleton Safety Nutlock

TWO nut-lock devices which keep a nut in place regardless of vibration of abnormal stresses are found in the Shekleton one-piece and the two-piece nut-locks for which the Hidalgo Steel Co., of New York, are the sole agents in the United States. Its simplicity recommends it for use on aeroplanes, where nut-locking is generally effected by the use of a castellated nut, drilled bolt, and a split pin.

The one-piece nut-lock is used with a recessed nut, the recess in the nut taking the place of the compression washer, facilitating assembly and reducing cost. By reversing the washer, it can be used to hold cap screws or for framework, bending the flanges as usual.

The illustration shows the two-piece nut-lock, for use with



any ordinary bolt and nut. In applying the lock, the washer is dropped over the bolt with the cone up, and the compression washer then dropped on. The nut is then applied and tightened down. Finally the tails of the lock washer are bent against the nut. In removing the lock, the tails are bent back, a wrench applied to flats on compression washer and turned with or without the nut. This action scores the soft lock washer cone without damaging the bolt thread. Washers are made in plain or Sherardized steel, aluminum or special metals.

CHIEF SIGNAL OFFICER'S REPORT TELLS OF WORK OF AIR DIVISION

THE Chief Signal Officer's Annual Report devotes considerable space to the aeronautic program. It shows that tremendous work had to be done in providing the necessary equipment and means of training for our aviators before any progress could be made in approaching the aeronautic program which we consider part of our contribution to the Allied cause. In dealing with aviation, the Chief Signal Officer says:

National Advisory Committee for Aeronautics

This committee, authorized by act of Congress, approved March 3, 1915, to supervise and direct the scientific study of the problems of flying with a view to their practical solution, to determine the problems which should be experimentally attacked, and to discuss their solution and their application to practical matters, includes representatives of the War and Navy Departments and the Departments of the Treasury, Agriculture and Commerce, and the Smithsonian Institute. It has rendered valuable aid and advice in all aviation matters under consideration.

Council of National Defense—Aircraft Production Board

This board was established by resolution of the Council of National Defense of May 16, 1917, to consider matters relating to the quantity production of aircraft in the United States and to co-operate with the Army and Navy in furthering their air programs. In its advisory capacity the board has rendered invaluable aid to the Signal Corps.

Joint Army and Navy boards on aeronautical cognizance, design and specifications, Zeppelins, and on technical aircraft were created and have insured the desired co-operation between the War and Navy Departments.

Air Division

This division of the office of the Chief Signal Officer of the Army has general supervision over all matters pertaining to aviation. To develop the new air program of the Army it was necessary to entirely reorganize this division. Its personnel has been enormously increased. It handles all matters of design and development of airplanes; the selection, training and commissioning of the officers of the aviation section; the recruiting and organizing of its enlisted personnel for duty at home and abroad; the training of aviators and the conduct and operation of aviation schools and stations.

The following table shows the sums appropriated for Army aviation purposes:

1912	$125,000
1913	100,000
1914	125,000
1915	250,000
1916	300,000
1916-17, urgent deficiency	500,000
1917	13,281,666
1917-18, urgent deficiency	43,450,000

A glance at the above table shows that prior to March 31, 1916, when the urgent deficiency appropriation for the year 1916-17 became available, but $900,000 had been appropriated for aviation purposes over a period of five years.

On July 1, 1916, twenty-three officers of the Regular Army had completed their training in aviation and were serving on duty with the aviation section of the Signal Corps. Twenty-six other officers were under instruction. A small number of firms were making aeroplanes or aeroplane engines. With one or more exceptions practically none of these were producing more than an occasional machine, and most of the product had been contracted for by foreign governments. Five officers were in Washington charged with the duty of overseeing the expansion of the aviation section of the Signal Corps.

The problem of the fiscal year 1918, therefore, was the problem of development, of securing the co-operation of the aeronautic industry and insuring its expansion, and of solving the innumerable scientific and engineering problems which must be met to send men and machines into the air to reconnoiter and to fight over unmapped country.

Many weeks were required to remove the obstacles in the way of obtaining suitable aeroplanes and aeroplane engines in large quantities.

Specifications of various types of machines were prepared by a board of technically trained officers assisted by consulting engineers from civil life; the facilities of the Bureau of Standards were used for the testing of various materials, and devices of all sorts which might increase the military efficiency of the aviator received trial.

The money provided by Congress for the purchase of a site for an aeronautical experimental station was used in the purchase of Langley Field at Hampton, Va. This site, ideal for both land and water flying, was selected after a thorough canvass of available tracts. The necessity for such a station became more and more evident as Army aviation developed throughout the year. The wisdom of separating experimental stations from fields where pupils were under instruction in flying was brought home forcibly with the expansion of the training program.

The National Defense Act of June 3, 1916, authorizing the organization of an Officers' Reserve Corps and an Enlisted Reserved Corps was made the basis for training a reserve civilian personnel of flyers and mechanics, and a system of instruction was adopted which, with amplification and modification, is forming the basis of the instruction of war pilots.

When, in April, the United States entered the European war the Chief Signal Officer availed himself of the offers of a number of civilian experts, scientists, engineers and business men of achievement to assist him by advice in meeting the problems of expansion which confronted the Aviation Service. Representatives of other governments at war were also consulted and, as a response, experts in every line of aeronautical work, airplanes and engines, photography, fighting in the air, radio and meteorology, men trained in the school of the European war were sent to Washington so that the combined experiences of three nations represented by about thirty officers and men became available to assist in finding a solution of the problems confronting the United States.

Although training machines could be obtained, the war aeroplane with its refinements of construction and its engine of unprecedented efficiency was practically unobtainable in the United States in April. The Liberty engine, which for power, lightness and efficiency compares favorably with the best European types, was under development in June.

By the end of June, 1917, the number of Regular Army officers trained and detailed to aviation duty had been increased from twenty-three to ninety-two, and, in addition, fifty-four civilians had qualified for commissions in flying capacities in the Signal Reserve Corps. The system of training civilians for commissions had been amplified by the organization of eight schools of military aeronautics, where prospective officers could receive schooling in military discipline, the principles of aeroplane and engine construction and operation, radio-telegraphy, photography, bombs and bomb dropping, and aerial observation, and at the close of the fiscal year many student officers were under instruction.

The program of action made possible by the Congressional appropriation that became available July 24, 1917, had been practically mapped out before the end of the fiscal year.

UNSHATTERABLE GOGGLES

ONE of the equipment questions which was decidedly puzzling to the executive officials of the French and British Air Services was the adoption of a goggle which could meet the exacting demands of all phases of air service activities, and after the most exhaustive tests it has been found that the glass combination known as "Triplex" has withstood every test in satisfactory fashion.

In this country the "Triplex" combination known as "Resistal" is manufactured by Strauss & Buegeleisen, of New York.

"Resistal" is made up of two layers of perfect optical glass with a layer of celluloid interposed, the whole being welded —not cemented—into a solid mass. The result is a crystal which has all the virtues of plain glass and all of the good features of plain celluloid with none of the drawbacks and dangers of either.

Unlike plain glass it cannot be actually broken even with a hammer blow, and although it can be cracked, cracking is not accompanied by flying glass chips and splinters which jeopardize the eyesight of the wearer.

It is not readily scratched, as is the celluloid, and has such qualifications as rigidity, durability and fireproofness which are foreign to the celluloid goggle. Neither is it affected by water, heat nor cold and the layer of celluloid provides a heat-insulating medium which effectively prevents "clouding up" of either side of the crystal due to moisture condensation.

It is further pointed out that the interposition of the celluloid layer reduces the transparency of the crystal less than five per cent. as compared with the plain glass, while the curved formation of the goggle lens results in a goggle which cuts off no more than five per cent. of the total possible field of vision. The crystals are made in either clear, amber or euphes colors and in several different styles.

"Resistal," so far as this country is concerned, is somewhere about two years old. Such a thing as safety glass, unsplinterable, ought to have interested the coach-building and motor-body building trades — especially the latter — but their attitude might be summed up by saying that they were not going to be taught their business by any lovers of new-fangled ideas. They had used plain glass and their fathers had used plain glass before them; they had found it good enough, and were quite content. Besides, fitting such a thing as this new glass was an entirely different matter from fitting the old, plain kind; it would involve some revision of ideas, some revision of methods, and, safety or no safety, it wasn't worth while.

Then there was the distrust of the potential user of such glass. He would not be persuaded that it was any better than the glass he had been used to; glass is glass, anyhow, and if you hit it you break it, no matter how it is made. It was carefully explained to the potential user that "Resistal" glass is built up of two layers of glass with a layer of celluloid interposed, which renders it impossible for a sheet of this stuff to splinter and fly. It became necessary to convince the sceptic that the celluloid sheets, confined between sheets of glass and inseparable from the glass, could not get any air and consequently could not burn.

Then came along another objector. He pointed out that you can buy ordinary glass at so much per square foot, while "Resistal" costs more—the expense of it made it prohibitive. But fortunately or unfortunately this particular objector got involved in a motor accident which tangled him up with a wind-screen that was made of ordinary glass, and after the accident his own mother would have had difficulty in recognizing him. Then he began to understand the first cost is not everything, and that a "Resistal" screen, which would have starred on the impact but would not have broken, would have saved the heavy bill for personal repairs, and, having become a convert, and being rather an important man in his way, he began to talk to some purpose.

In the European countries the glass-celluloid combination is considered indispensable, and one of the best safeguards for the eyes of the eyes of our army.

STABILITY IN GENERAL*

By HARLAN D. FOWLER, Aeronautical Engineer

(*Continued from page 617*)

PART II.

Longitudinal Stability as Applied to the Monoplane

THE proper positioning of the center of applications will now be taken up. There are four forces acting upon an aeroplane, or seaplane, while it is in flight. These are (1) the total weight (*W*) of the machine acting downward through the *C.G.;* (2) the lift (*L*), created by the wings and some parts of the aeroplane, acts upward through the *C.P.;* (3) the resistance (*R*), offered by the whole machine when subject to wind pressure, acts through the *C.R.;* (4) the thrust (*T*) of the propeller, acting through the *C.T.*

For straight horizontal flight (see Fig. 9.)

$$L = W \qquad (1)$$

$$T = R \qquad (2)$$

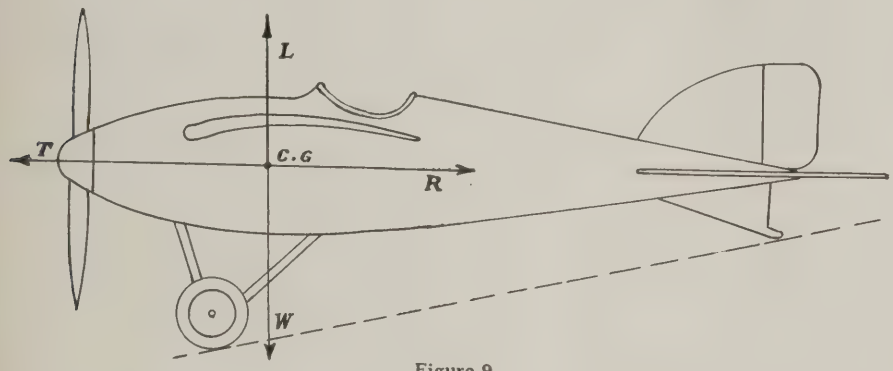


Figure 9

To secure equilibrium at all times, either all the forces must meet at the *C.G.* of the aeroplane; or couples must neutralize each other, or be neutralized by the elevator or rudder. These couples are known as the lift-weight couple and the thrust-resistance couple. In Fig. 10 the lift-weight couple is *L* times the distance *y* that the resultant force (represented by *L*) acts from the *C.G.* The thrust-resistance couple is *T* (or *R*) times the distance *x* that the thrust or resistance acts from the *C.G.* For stable flight in a horizontal path $Ly = Tx$ (3) or $Ly = Rx - Tx'$ (4) which two equations represent two cases of equilibrium, as explained by Figs. 10 and 11.

Let the forces act as shown in Fig. 10. The direction of the force *T* about the *C.G.* will tend to revolve anti-clockwise—or causing a negative moment. The moment of *L* will be clockwise, or positive. Therefore, if Tx acts downward, Ly should act upward, and the values of their moments be equal. As *R* passes through the *C.G.* this force will not cause any moment.

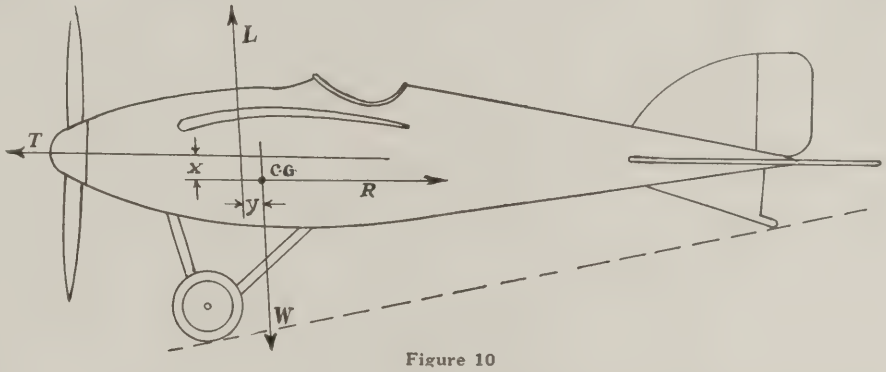


Figure 10

However, in Fig. 11 we have an entirely different state of affairs. This system of forces is used to a large extent in present practice owing to the tendency of the system to adjust the machine to its proper gliding angle immediately on the stopping of the engine and is to be recommended, whenever practical, though with the usual careful design. In this case $Ly = Rx - Tx'$ when in stable horizontal flight. The moment Rx being greater than Tx' tends to produce clockwise—or positive, action. Ly tends to revolve anti-clockwise, or negatively, thus introducing a righting couple, but its moment need only be equal to $Rx - Tx'$. But the instance the propeller ceases to generate the thrust, Ly must then equal Rx. If Ly cannot equal this couple then the elevator must be depressed, thus lifting the tail of the aeroplane and assisting Ly in keeping an equilibrium condition. When a machine assumes its gliding angle the angle of the wing approaches zero, thus causing the *C.P.* to move rearward.

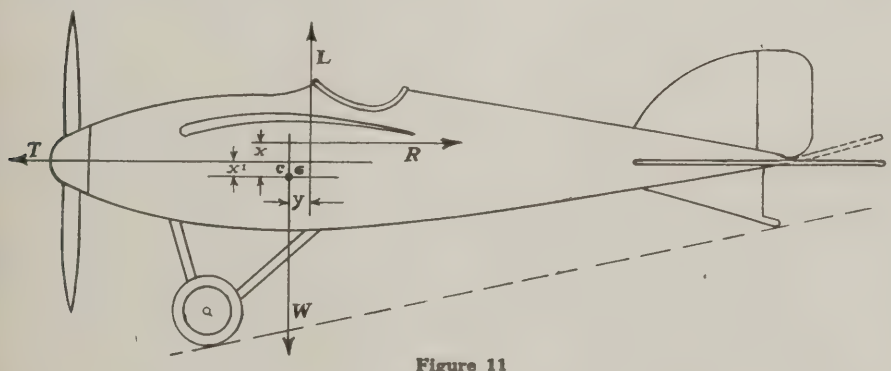


Figure 11

In the first case, when the propeller ceases to turn $T = O$. The lift-weight couple is the same, and as there is no resisting moment to Ly this force will tend to turn the machine upward and backward about the *C.G.*, the result being, if carried beyond about 15° in most machines, a stall, which will eventually end in a tail slide.

In the latter case, Fig. 11, when $T = O$, the force Ly, if properly arranged to overcome Rx, should turn the aeroplane over on its nose, thus automatically setting the machine at its proper gliding angle.

It is to be pointed out that the value of *L* is equal to the weight of the machine, and however slight the distance *y* may be a strong moment is generated. *R* being small in comparison will have to have a greater arm *x*. if its moment is to equal that of Ly, for example, $L = 2{,}000$ lbs., $y = .2$ ft., and $R = 300$ lbs., from the formula $Ly = Rx$, we have

$$x = \frac{200 \times .2}{300} = 1.333 \text{ ft.}$$

or 1.133 ft. greater than *y;*

An assumption will be made that the aeroplane in Fig. 11 is not in equilibrium and that in order to bring the machine into this state we wish to know the corrective force necessary to accomplish this result. The following values are assumed; $-T = 300$ lbs., $x' = .1$ ft.; $+R = 300$ lbs., $x = .2$ ft.; $-L = 2{,}000$ lbs., $y = .3$ ft. Therefore $-Tx' = -30$ ft. lbs., $+Rx = +60$ ft. lbs., and $-Ly = -600$ ft. lbs., or a resultant moment of -570 ft. lbs. to be corrected by the elevator. The distance of the normal *C.P.* of the elevator from the *C.G.* is 20 feet, therefore, the pressure necessary to bring about the righting moment is $\frac{-570}{20} = -28.5$ lbs. From which we can determine the angle at which the elevator should be set. The minus sign denotes that the elevator must present a negative angle of inclination to the wind, *i.e.*, the elevator is turned up, the result is that the tail is brought down and the nose raised.

Other ways of placing these forces may be devised, but the same reasoning should be used as given above. *W* always passed through the *C.G.*, and so should *T* and *R*. If this cannot be done *T* should be below *R*, and either slightly below or above the *C.G.* *L* may be made to pass through the *C.G.* at a certain angle of attack of the wings, but as the angle increases or decreases beyond this particular position the line of action of *L* may move forward or back of the *C.G.* In all cases the moments of the forces about the *C.G.* should be as small as can practically be accomplished. The minimum they are the better the stability is and the less effort there is to work the controls.

The elevators, in certain aeroplanes, are subject to a positive pressure, while in others they are subject to negative pressure. When such forces exist as shown in Fig. 10 a negative tail would be of value, for when the downward thrust of the propeller is relieved the tail rises and prevents a stall.

As explained previously, at any angle of attack, there is a certain position of the *C.P.* To cover the range of high and low speed and the consequent movement of the *C.P.* there must be a compromise with the *C.G.* In other words,

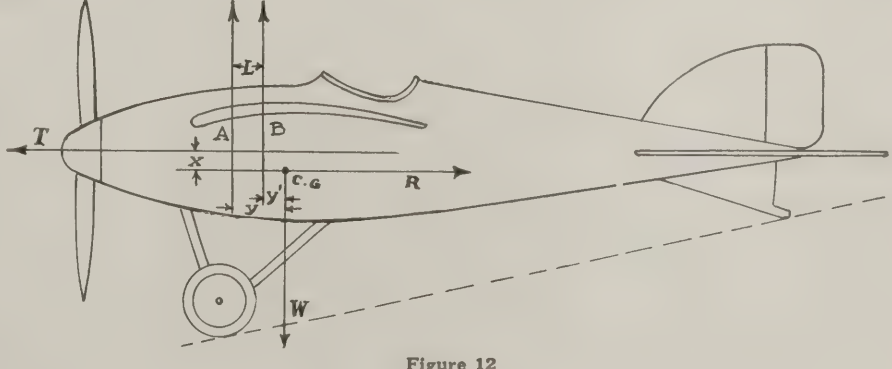


Figure 12

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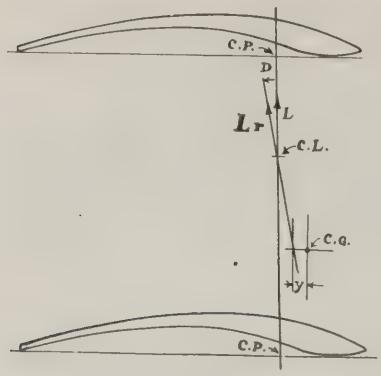


Figure 13

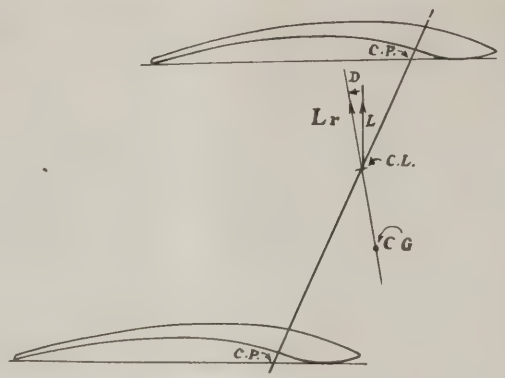


Figure 14

the *C.G.* should be placed so that a minimum distance between the *C.P.* and *C.G.* is maintained at all speeds. In Fig. 12 there is represented a continual thrust-resistance couple *Tx* and is equal to the lift-weight couple *Ly*. When starting out fully loaded, and at a high angle of incidence, say 14°, the *C.P.* will be situated at *A*. As the fuel load lightens the speed becomes greater and the angle smaller, perhaps to 8° and the *C.P.* recedes to the point *B*. To certain angles, between 5° and 8°, the total resistance will also decrease, and when properly designed, at 8°, *Tx* should equal Ly^1. At angles less than 8° *R* increases and to counteract the increase in the couple *Tx*, another force, *C.G.*, should move back in proportion to take up this moment. This may be accomplished by suitably placing the fuel load so that as it decreases the *C.G.* moves back. Now while this is an ideal method of balancing the couples, the construction of the aeroplane may not permit it. Instead of having an opposing couple, a couple tending to act in the same direction as the other couple are sometimes used, and the righting balance controlled by the elevators. However, in all cases, the values of the moments of these couples depends upon the wing section employed and the point of application of the forces *R*, *T*, and *W*.

When an aeroplane is rising from, or alighting on, the ground, a frictional resistance is set up by the wheels. This frictional resistance is due to the friction caused by the wheels turning on their axles and the tires coming in contact with the ground. The combined resistance, for a hard grassy surface and an ordinary axle, will probably come close to 30 pounds per 2,000 pounds weight of the aeroplane, while on muddy or snow-covered ground the resistance will be from 70 to 100 pounds, and sometimes over this, depending upon the conditions of the ground and the speed, and wheel surface coming in direct contact. In landing, the resistance on the first shock will be great, while the succeeding bumps will cause less disturbance. As these are only temporary forces, and if not too large, the elevator should handle them easily. However, when landing on snow-covered ground unusual dexterity on the part of the pilot will be called into play, and if the elevators are not large enough the aeroplane will quickly turn over on its nose. A flat landing should always be attempted, especially in such circumstances.

As Applied to the Biplane

The biplane is subject to the same forces affecting the monoplane, with the exception that instead of considering the resultant force acting through the *C.P.* of the wing it acts through the *C.L.* The *C.L.* in a biplane is always found between the two wings and generally is found nearer the top wing, on account of its superiority in efficiency over that of the lower wing. The location of the *C.L.* is given by the formula $d = \frac{Lt \times D}{Lt + L_b}$ (5) where *d* is the distance from the center of pressure on the lower plane to the center of lift in feet; *Lt*, the lift of the top plane; L_b, the lift of the lower plane with the loss deducted; and *D*, the distance between the chord lines of the planes in feet. The resistance of the wings is also considered acting at this point.

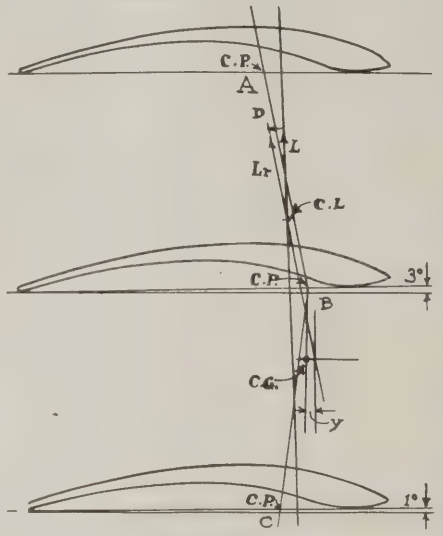


Figure 15

In an orthogonal biplane the resultant lift vector is taken as passing through a line connecting the *C.P.* of each plane at the point determined for the *C.L.* The resultant lift direction is determined by a graphical lay out of the lift and drift components of the wings. Let *D* = calculated drift; *L* = calculated lift, then the resultant force $L_r = \sqrt{D^2 + L^2}$; the inclination of this force to the wind is $\theta = \tan^{-1} \frac{L}{D}$. The distance *r* of L_r from *C.G.* is measured horizontally opposite the point *C.G.* to the line representing the resultant lift, Fig. 13.

The resultant force and its direction of application are similar on the monoplane, with the exceptance that the lift and drift components are laid off directly from the chord of the wing instead of from the *C.L.* of the biplane. The line of action of *L* shown on the previous diagrams were merely illustrative, so as to avoid too many complications of this study in one section.

Having determined the relative position of L_r and *C.G.* for a biplane the laws of couples for monoplanes are now applicable.

In a staggered biplane, where one wing extends beyond the other, similar calculations for solving for an orthogonal biplane are used. However, attention is called to the fact that the line connecting the position of the *C.P.* in each wing will not be situated on a perpendicular line to the chord, but as shown in Fig. 14.

As Applied to the Triplane

The distinction to be made for a triplane is that one more wing will have to be considered and the consequential shifting of the position of the *C.L.* From triplane characteristics, the top wing carries the greatest load, the lower wing a smaller load, and the middle wing the least load, per sq. ft. The *C.L.* is calculated from the formula $d = \frac{Lt\,(D + D')}{Lt + L_m + L_b}$. (6)

where *d* is the distance from the chord line of the bottom plane in feet; *Lt*, the lift of the top plane; L_m and L_b, the lift of the middle and bottom planes, respectively, with the losses deducted; *D*, the distance between the chord lines of the top and middle planes in feet, and *D'*, the distance between the chord lines of the middle and bottom planes in feet.

In some cases there may be a complication in movement of the *C.P.* due to the employment of different wing sections or that the wings may have an angular setting of the chords to each other. Where aerodynamical tests are not available an average taken of the two vectors joining the *C.P.* with the adjoining wing will be sufficiently close for preliminary designing purposes. This is clear in Fig. 15. Locate the centers of the lines *AB* and *BC*, the lines of which pass through the *C.P.* of its respective wing, join them by a straight line; the result is the assumed line representing the average position of the *C.P.* of the three wings. With the *C.L.* located the other forces may be worked in as before.

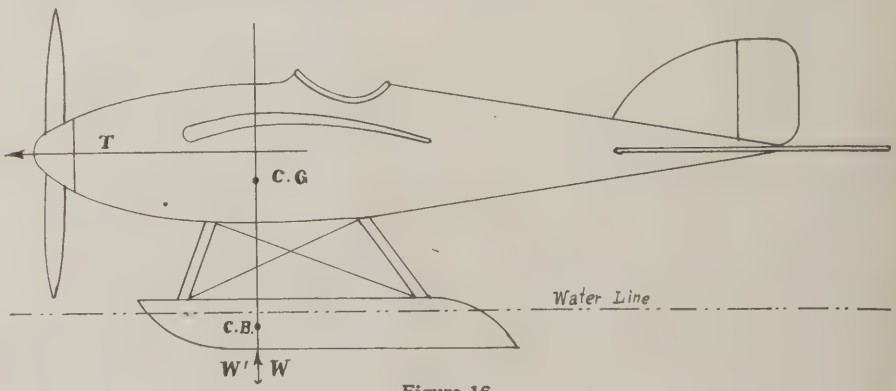


Figure 16

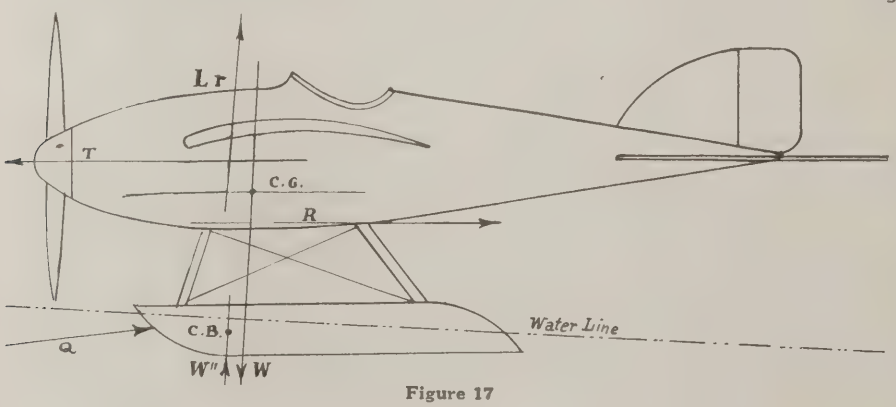


Figure 17

As Applied to the Seaplane in General

All that has been written regarding the stability of the aeroplane is equally applicable to the seaplane. In place of the resistance offered by the wheels when starting or alighting on the ground, there is substituted the resistance of the floats, or pontoons, when starting or alighting on the water, and is much greater than the former. So great is this resistance that two additional forces must be considered. These forces are the buoyancy (*H*) of the floats acting through the center of buoyancy (*C.B*) and the resistance (*Q*) of the water to the motion of the floats.

When at rest on the surface of the water the conditions for equilibrium are that the *C.B.* of the float (or floats) and the *C.G.* of the machine are in the same vertical line; also that *W* is equal to the weight (*W'*) of the water displaced by the float. Owing to the actions of *Q* and *T* on the float when getting off, the float has a upward curved bottom at the front, so that as the value of *T* increases, which will cause the sea-

plane to nose over, this curved bottom tends to push up out of the water due to the pressure Q and thus counteracts the effect of T to force the nose under. Fig. 16.

As the seaplane is started the float will depress and the *C.B.* will advance; the buoyancy of the float is now less than W, or W'', but due to the lifting effect of the pressure of the water on the float, W is entirely sustained, Fig. 17.

Still increasing the speed the force of Q being on the float, and the position of the *C.B.* and designating the arm of Q and W''' by q and w respectively, we have for the total weight $W = 2000$ lbs. We will assume that the wings are carrying 1,800 lbs. of this load, and the float 200 lbs. Therefore,

$+ L_r = + 1800$ lbs., $y = .5$ ft. $+ L_r \cdot y = + 900$ ft. lbs.

$- W''' = - 200$ lbs., $w = 3$ ft.; $- W''' \cdot w = - 600$ ft. lbs.

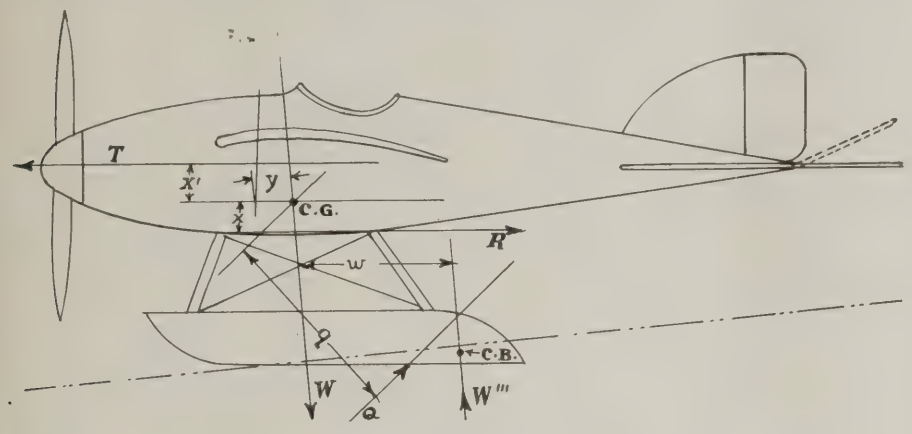


Figure 18

comes greater, and the nose of the float will be forced up, and the *C.B.* moved back to a position back of the *C.G.* Due to the increase in speed the wings are beginning to take up part of the load and the buoyancy of the float becomes less — (W'''.). The forces are now as shown in Fig. 18.

Just before the seaplane rises from the water the forces Q and W''' are going through a quick-

$- Q = - 250$ lbs., $q = 5$ ft.; $- Q \cdot q = - 1250$ ft. lbs.

$- R = - 350$ lbs., $x = .2$ ft.; $- R \cdot x = - 70$ ft. lbs.

$- T = - 600$ lbs., $x' = .2$ ft.; $- T \cdot x' = - 120$ ft. lbs.

The total moment is $- 2040 + 900 = - 1140$ ft. lbs., and that the center of pressure of the elevator is 20 ft. from the *C.G.* of the ma-

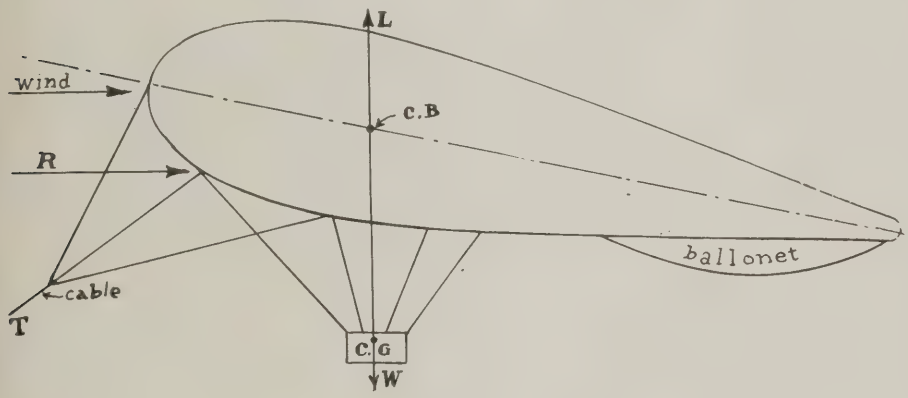


Figure 19

ly diminishing change, due to the wings now taking up nearly the entire weight of the seaplane, until when the machine rises off the surface they both become zero, and the four forces (W, R, T, and L_r) are the only ones remaining.

Similar actions take place on the flying boat.

The landing of a seaplane requires very delicate handling, for too steep a glide may precipitate the entire seaplane forward into the water.

An approximate example for determining the force necessary to keep the seaplane, Fig. 18, in a position of equilibrium is given. Having arrived at the approximate point where Q is act-

chine, the force necessary to be exerted by the elevator is $-\frac{1140}{20} = - 57$ lbs., the elevator again being inclined at a negative angle to the wind.

It is to be understood that these forces are varying rapidly at every period, from the time the seaplane is started until it rises from the water, and when once off, the controls will work more evenly. However, up to about a speed of 25 or 30 m.p.h. the elevators cannot give much reaction due to the lack of air-pressure on the surfaces.

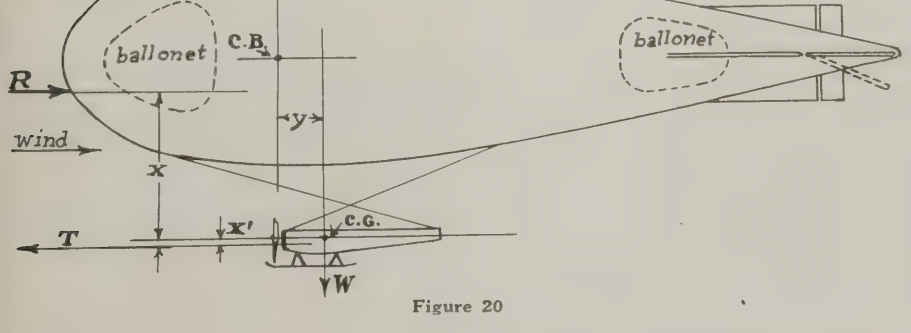


Figure 20

With a single-float seaplane, the necessary longitudinal or lateral stability cannot be obtained, unless the float be sufficiently long and wide.

With the two-float machine, unless both of the floats leave or touch the water at the same time, the machine tends to rotate horizontally, and is likely to bring severe strains to bear upon the structure. Where auxiliary balancers at the wing tips are used, and with a single float seaplane, and where one of them suddenly dips into the water due to the machine tilting while flying on the surface, the wing to which it is attached is likely to be severely distorted or badly damaged.

Longitudinal Stability as Applied to the Kite Balloon and Dirigible

A kite-balloon or dirigible is acted on by four forces, and are (1) the weight (W) of the airship less the weight of the gas contained in the envelope, (2) the buoyancy or lift (L) of the gas acting through the center of buoyancy (*C.B.*), (3) the resistance (R) of the car and bag acting through the *C.R.*, and (4) the thrust or pull (T) of the cable through the *C.T.*

When sustained in the air with no motion whatever, a kite-balloon takes an attitude such that the *C.G.* lies on the vertical passing through the *C.B.* of the gas containing envelope, and the ship is in stable equilibrium, and when in this state of equilibrium the body tends to place itself broadside to the wind, say 30°. In this case W is the weight of the airship less the weight of the gas. See Fig. 19.

The pull of the cable is balanced by the resistance of the air, and the resistance-thrust couple should equalize, *i.e.*, the moment of R about the *C.G.* must equal the moment of thrust or pull T about the same point.

A kite-balloon when set free and presented broadside to the wind will assume its stable "drift-angle," and the pull T of the cable will act at the *C.R.* of the entire structure. Any variation in inclination being taken up by the short cords and transmitted to the cable, and the pitching or yawing of the kite-balloon will be diminished to a small factor. However, as the aircraft is always subject to wind pressure and therefore to the fluctuations of the wind, the observations will continually be interrupted by the constant shifting of the bag and car. The low position of the *C.G.* will assist greatly in restoring the ship to a reasonable stable condition.

The Dirigible (Longitudinal)

The dirigible is an advanced type of kite-balloon, but subject to the same governing forces. While a kite-balloon maintains an angular attitude to the wind during sustentation, the dirigible is kept on a horizontal keel, except when ascending or descending. In straight horizontal flight, the *C.G.* will have moved back of the *C.B.* (compare Fig. 19 by inclining it to a horizontal position before the eye, and the *C.G.* will recede from the vertical). This position of the *C.G.* should be brought as close as possible in line with the vertical passing through the *C.B.*, so that for all angles of flight the elevators will be capable of handling the upsetting couples.

With the increase in speed, the system of forces (R, T, and L) in Fig. 20 tends to throw up and back, relative to the *C.G.*, the entire dirigible, but the lift component on the rear elevating plane will right this upsetting tendency, provided these forces are not too great.

For example, assume the following values for the forces in Fig. 20, L = weight of airship (W)

$+ L = + 5500$ lbs., $y =$ 3 ft.; $+ L \cdot y =$	$+ 16{,}500$ ft.-lbs.
$+ R = + 700$ lbs., $x =$ 20 ft.; $+ R \cdot x =$	$+ 14{,}000$ ft.-lbs.
$+ T = + 700$ lbs., $x' =$ .3 ft.; $+ T \cdot x' =$	$+ 210$ ft.-lbs.
	$+ 30{,}710$ ft.-lbs.

The distance from the center of the elevators to the vertical passing through the *C.G.* = 160 ft. Therefore, the force necessary for the elevators to exert in order to keep the dirigible in equilibrium is $\frac{+ 30{,}710}{160} = + 192$ lbs. As the sign is plus the elevators will have to be turned down, with the result that the aft part of the dirigible will be raised.

In the illustration are shown two ballonets. The proper manipulation of them will also assist in keeping fore and aft stability by extending or relaxing them according to the interior pressure of the bag. Their distance from the *C.B.* should be considered when discreet use of them is employed.

Where more than one wing is used, such as a biplane or a triplane, the *C.L.* is employed similarly to that applied in the aeroplane.

(*To be continued*)

FOREIGN NEWS

AFRICA

According to *Flight* (London) Captain Miller, D. S. O., has accomplished a flight from Cape Town to Port Elizabeth within five hours. He came down once owing to a damaged propeller. The distance from Cape Town to Port Elizabeth in a straight line is 300 miles.

Flight-Commander Moon, R. N. A. S., who was captured by the enemy in German East Africa, has succeeded in rejoining the British forces. His seaplane fell into the Mbumi River, owing to magneto trouble. Commander Bridgeman, who was observer, died from exposure, but Moon was washed out to sea on a raft and eventually succeeded in reaching shore.

AUSTRALIA

Lieut. Stutt, chief of the Richmond, N.S.W., Flying School, flew in a Curtiss biplane from Point Cook to Richmond, 600 miles, in seven hours 20 minutes actual flying time, establishing a longest Australian non-stop record—viz.: 342 miles in four hours and ten minutes.

FRANCE

The Official Statement for December 20 contains the following paragraph on aviation:

"Yesterday German aeroplanes dropped bombs in the region of Dunkirk and Calais. Four persons were killed and ten wounded."

A summary of aerial activity for December 11 to 20 was issued on December 23, as follows:

"In the period of December 11-20, inclusive, fourteen German aeroplanes were brought down by our pilots and three others were forced to land in a damaged condition inside their own lines. In addition, three enemy machines were brought down by the fire of our special guns."

A supplementary report issued the same day contains the following statement:

"On the evening of December 22 German aeroplanes dropped forty bombs on Dunkirk and its vicinity, killing one civilian and wounding three others, among them a woman and a child."

The Germans conducted an air raid on Dunkirk on the night of December 18. Fifty bombs were dropped. No casualties were reported.

GERMANY

The official statement issued on December 23 reports night raids as follows:

"Aerial activity was very strong throughout the day in many sectors and also marked during the moonlight night. Bombs were dropped freely on Sheerness, Dover and Dunkirk, as well as on depots behind the Anglo-French fronts."



A British seaplane scout with twin floats

GREAT BRITAIN

On December 20th a special aviation report was issued by the British War Office, as follows:

"Heavy snow prevented flying on Monday except on a small portion of the northern front. In this locality bombs were dropped on a hostile airdrome near Courtrai. Enemy trenches also were attacked with bombs and machine gun fire. At night the station at Roulers and the stations at Menin were bombed heavily by us.

"In air fighting two German machines were brought down in our lines and two others were driven out of control. One of our machines is missing.

"Good work was done in the air on Monday by Australian pilots. Two of them who were attacked by many hostile scouts when employed on artillery work succeeded in bringing down one of the enemy's machines in our lines and dispersed the remainder.

"On Tuesday a thick haze again limited flying to the northern part of the front, where a great deal of artillery photographic work was done. During the day over 150 bombs were dropped on the enemy's railway stations, sidings and trenches, and many rounds were fired from the air into trenches and billets.

"Fighting in the air on this part of the front was intense all day and resulted greatly in our favor. Seven hostile machines were brought down by our aeroplanes and one was shot down in our lines by anti-aircraft gunfire, and another by the fire of our infantry. Three others were driven down out of control. Three of our machines are missing.

"After dark yesterday our aeroplanes bombed the St. Denis Westrem, Roulers and Lichtervelde airdromes and the Thourout, Ledeghem, Cambrai and Menin railway stations. All of our machines returned."

On December 21st the following aviation report was issued:

"Three hostile machines were brought down in air fighting Wednesday, and two others were driven down out of control. One of our machines is missing."

Direct hits were made on the night of December 18th by British naval aviators on buildings of the Brugeois works at Bruges, held by the Germans, an Admiralty statement announced.

A large fire was seen after the aviators had dropped their bombs. The statement also said several direct hits were made on sheds of the Vlissenghem aerodrome.

British naval aircraft conducted a successful bombing raid over the Engel aerodrome, which an official announcement issued December 19th describes as follows:

"Naval aircraft dropped bombs, which burst close to the sheds and on the ammunition dump and railway sidings at the Engel aerodrome on Tuesday. One enemy aircraft was brought down ablaze and one out of control. All of our machines returned safely."

On December 18th the Germans conducted an aeroplane raid on London, resulting in several deaths, but no military damage. The official announcement issued the day following is quoted in full. One of the raiding machines was shot down.

"Last night's air raid casualties were: Ten killed and 70 injured in London; only 5 injured outside London.

"Several fires occurred. The material damage was not serious. There was no damage to naval or military establishments.

"The latest reports indicate that from sixteen to twenty enemy aeroplanes took part in last night's air raid. Three groups of raiders crossed the Kent coast between 6:15 and 6:25 P. M. Three other groups crossed the Essex coast between 6:10 and 6:45 P. M.

"All six groups made toward London. Most of the raiders were turned back by gunfire at various places, only about five machines actually reaching and bombing the capital between 7 and 8 P. M.

"After the main attack on London had terminated a single aeroplane made its way over the capital, about 9 P. M.

"One raider, hit by gunfire, finally came down in the sea off the Kentish coast, two of its crew of three men being captured alive by an armed trawler. There is reason to suppose that another enemy aeroplane came down in the Channel, but this has not been confirmed up to the present.

"One of the our pilots attacked and fired two drums of ammunition into a raider as the latter was in the act of dropping bombs on London from a height of 13,000 feet. Another of our pilots also engaged the enemy over London, and a third in the vicinity of the capital at 11,000 feet. All our machines returned safely.

"Bombs also were dropped at various places in Kent and Essex."

On the night of December 21st another air raid was attempted on London. The following official announcement was issued:

"An air raid was attempted on the Kentish coast shortly after six o'clock tonight. One raider was forced to descend close to the coast, the crew of three men being captured alive. No other machines have come overland at this time.

"A second attack developed at about half-past nine o'clock, when a few bombs were dropped in Thanet. The raiders did not penetrate further inland. No casualties or damage is reported."

HOLLAND

Five bombs were dropped on the town of Goes, in Zealand, damaging several houses and seriously injuring one man. No statement has been made as to the nationality of the raider.

According to the *Nieuwe Rotterdamsche Courant*, a German aeroplane landed in the province of North Brabant on Saturday, and the occupants have since been interned.

ITALY

A report from Italy announces that aerial mail service between Sardinia and the Italian mainland has been in reliable and successful operation for a period of six months. The trip is made daily, rain or shine, in about two hours.



MODEL NEWS

Edited by G. A. Cavanagh



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Paper Models

Many of our readers will welcome the accompanying photograph showing a paper model, which was made by Mr. R. F. L. Gosling, and they will be able to see from the photograph what a presentable little model can be obtained by the use of paper. Mr. Gosling's model is made entirely of cartridge paper, with the exception of the chassis and wheels, which are made of wire and wood. The scale is about 1 in. = 3 feet in comparison with full-sized aeroplane.

Seccotine, or some similar substance, will probably be found the most useful adhesive for sticking the various parts of the



Mr. Gosling's paper reproduction of the L. G. machine

model. If made with care these models should enable many interesting gliding experiments to be carried out, affording both amusement and enlightenment on many aerial problems.

A 2-oz. Model Tractor

As we know there are a number of readers who are interested in small models, which are not, of course, without their uses and conveniences, Mr. Horner's model described herewith should be of especial interest to them. In his communication, Mr. C. C. Horner says: "I kept strict notes of areas and sizes of planes used; also the changing of one plane for another, of all alterations made in the rudders, tail, &c. I made no less than ten small planes and the same number of tails, and the model illustrated is the outcome of a large number of experiments, my idea being to obtain the most practical model for the least possible weight.

"*Fuselage.*—After experimenting with several types, I chose the one now used, as it had several advantages compared with either the one in which the single stick is used or two curved ones running side by side, viz.: strength; the main-plane rests firmer than on a single stick, and it is easier to move to and fro along the longitudinal frame; the tail works in less disturbed air than when two longitudinals are used running the full length of the model, as the single stick under the tail tapers from ¼ in. by ¼ in. to ¼ in by ⅛ in., and is circular on the underside; no extra weight is carried except where absolutely necessary due to strain; shows only a slight tendency to twist under torsional forces due to rubber strain; small head resistance due to shape and lack of bracing as is necessary in single stick type.

Main plane.—Principal characteristic is its backward sweep (see plan); this shape was chosen as it was found that it had a decided advantage over a straight plane in the matter of showing greater longitudinal stability—especially in a strong wind. For lateral stability the usual type of dihedral angle is employed.

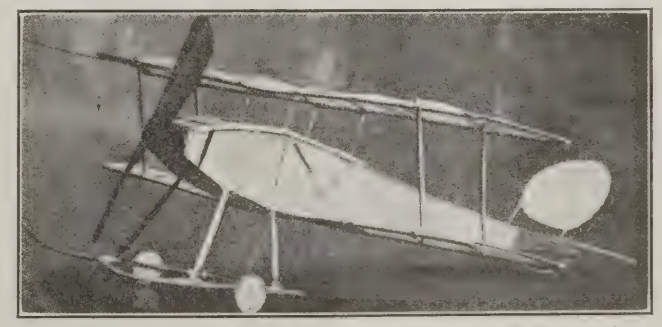
Tail.—This part also had its share of time spent on it, and it was found that a long narrow plane as now used worked in better harmony with the type of plane before described than a Blériot type, where the length ran across the flight path rather than with it—this type seeming to rise and fall the whole time, although no general effect was apparent with respect to the model except that in a wind a sharp nose dive often occurred—which does not happen with the type here advocated, this type always flying level to the flight path.

Rudders.—I found two rudders side-by-side far more sensitive than one larger one of the same area, also that they kept the model more stable. The larger one affected the model most when banking, causing it to side-slip far more than the two did.

Landing devices may be summed up as follows.: (*a*) very strong and light, yet supple and springy; (*b*) small head resistance, and easily attached to the frame; (*c*) disc wheels used, which are neat and suitable in every way. [A fault in this part of the design appears to be the absence of a forward skid to protect the propellers when landing.—Editor.]

In conclusion, the model is a good flyer up to 150 to 200 yards, and is very stable longitudinally and laterally, and is also in proportion to a full-sized machine as far as possible; the power used is small, and it rises from the ground quite successfully. Total weight complete, 2 ozs.

Materials.—Wood *fuselage*, ¼ in. by ¼ in., ⅛ by ⅛, and ¼ by ⅛. Main planes, ⅛ by ⅛; fabric, Bragg-Smith proofed silk; cane tail plane, ¼ by ⅛; ditto landing device, ⅛ by ⅛. Wire rudders, 1½ in. by 2 in., same fabric as on main plane. All joints bound and glued, complete model stained and varnished. Propeller, wood, 9 in. by 1 in., 11 in. pitch.



A scale model of one of the British machines that will fly. Built by an English model flyer



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

THE MORALS OF THE WINGED TRANSFER

[A Tale of the Avro Transfer, by "DHINGBAT."]

Featuring Lieut. Pimp, R.F.C. (on probation), the "Hun Pilot," of No. 55 Squadron, in 3 reels of laughter at 1,500 feet.

PROLOGUE.

THE curtain suddenly rolls away like stripping fabric in a vertical nose dive. Behold, amid cheers, Our Hero, Lieut. Pimp, rigged complete with another coat, cap, goggles and gauntlets, effectively screening his individuality and personal charm, which needs no description.

With practised poise he gazes skywards whilst his starboard arm rests with accuracy on No. 1 cylinder of the 100 Mono. His broad shoulders dent the coal box cowling and carefully cover up the makers' artistic nameplate that the audience may remain unprejudiced.

Reel 1 follows immediately.

It is midsummer's day at No. 55 Training Squadron, but no different from any other ——— day as the subs. say, except that dawn and dusk are farthest apart. Due to Pimp's uncontrollable sky-larks he is only permitted upstairs when the air is clean and fresh at early morn, or after everybody else has finished with it in the evening.

Glorious though the broiling sun shines during restricted hours—the breeze is up, and with nothing doing, he is meditating on possibilities in blissful ignorance of the world outside.

One, the "Old Man," is recommending him to sprout the heavenly wings because he is so unearthly, or the more likely alternative that he must borrow a pair and hastily fly home with his own officially cut.

Suddenly he is electrified into action, like the 3rd A.M. who, whilst an engine was running felt the sparking plugs to see if they were heating up. Pimp, Our Hero, bolts for the sheds, and in less time than it takes to say "Lieut. Robinson" his favorite 504j was nosed into the wind, greased up to every split pin, ready for speed.

Contact! All clear and with hurricane swish he bumps skywards, up and up, forgetful of his empty front seat, but thrilled with the thought that no mere instructor could cut out his engine or give a stunt or correcting tug at his Joystick. Still heavenwards he goes, little heeding his proximity to the other place in his reckless manœuvers.

Here the faker's art excels itself, for thrown on the screen is Pimp in his cockpit with the instrument board, taken at 1,500 feet at grave risk to the operator, who, it is alleged, was supported by hot air balloons supplied by the Air Board.

With bated breath the audience watch his altimeter swing up from 2,000 to 10,000 feet at a speed rivalling a cheap alarm clock whilst by blowing down the pilot tube an unofficially recorded airspeed of 130 miles an hour is shown. Incidentally, the pressure gauge and revolution counter are at zero.

Up, ever up, he climbs, passing repeatedly from the bottom to the top corner of the screen.

Finally flattening out against the ceiling at 15,000 feet, Lieut. Pimp peers over the side of his warped starboard longeron and surveys the world in wonderment beneath. Remote from civilization and its restraint —excepting the unnerved operator hanging on just outside the picture —on and on he careers, musing in his loneliness.

Reel 2 follows immediately, after the lights have risen and faded to assure the management that all's well with the audience.

Pimp is speaking to himself in emphasis of his loneliness. "Here's your opportunity to make a bid for fame, and, as if synchronized with the thought, my engine cut out. Down went the nose of the A.495, and in frantic fumbling at throttle and switch I even forgot to try and tug out my stick. Unnerved, I first looked at the air speed indicator mounting fast to 185 in a dead vertical nose dive. Down, down, she went, and, waiting as if to overcome a sickening nausea, I gave a yell and fiendish wrench, holding the control column hard up to my chest. Will she flatten out? Will she break her back, could I trust the winged transfer? With these queries rushing through my droning head it seemed as if Fate spoke to me in the musical tone of the vibrating bracing wires, which nearly screeched at my gathering pace.

Then, just as earth began to show under me, crash went my stick down at the stump—slump! into and over the back of my seat. They had caught the fairing, and dazed, I lay viewing the fairy-like seat bearers with that trapeze suspension, and thinking how quaint was the fuselage inside. Senseless I must have been, but only for moments, but roused in revenge, I strafed demon designers' splices to right and splices to left, all riddled with screws, dud joints, I was sure, until half silly and dazed, letters and numbers became fixed in my gaze. The sight fogged at my fast maddening brain, and "All in Distress" came into my mind.

Then, just as if to reassure, I traced out the stamp, so skilfully faint, and read in amazement "A.I.D."

It was moments only, but seeming hours, I came out of my musings, and noting the bold black "W.D." with thought of Courts of Enquiry, and mention of me, frantic efforts I made.

Like an unlocked turnbuckle I wriggled and turned, regaining my feet and looking around, there were the sheds a thousand feet down.

To nose into them seemed inevitable, and in an instant I was up and out on the cowling clambering on to the empty seat. A grab at the centre section struts checked a headlong fall to earth.

Facing the wind at a gale I gained the cockpit exhausted and unnerved to forget all but a crash and a thundering roar as I failed in my effort to regain control.

In the wrong end I mused and swore and pictured a note in "The Joy-Stick," which would record that poor Pimp crashed to the ground with a dull, sickening thud, and a cross marks the spot where the body was found.

I dreamed of France fighting, and fame, with a glorious record of twenty men down, and feted and feasted as the squadron's star turn.

I awoke with a start and gazed around, drew my breath slowly and gazed in awe. Three brawny great Boches were raking about the neat stack of debris I had so neatly piled.

With aching bones I stared aghast at the sight, wondering in panic if it was some nightmare or an actual fact.

Lying dead still, I shut my eyes, until a kindly voice of the Flight C.O. called: "Pimp, are you hurt?" More startled than ever I propped up myself to see the whole squadron wreathed in smiles.

Then came my instructor, and, taking my arm, told me a story to settle my unhappy mind in easy stages. All was a dream and a carefully planned stunt, for my personal benefit, he afterwards assured me.

Reel 3 follows to link up the marvellous hair-raising events with the more ordinary truth.

Poor Pimp had simply wearied of a slack day, and losing himself intentionally, has wandered round to the wreckage dump at the back of the sheds.

Selecting a much damaged Avro seat loosely attached to the slender bearers, he selected a place in the sun and propped himself up on sundry petrol cans. Falling asleep, an unkind soul had disturbed his undercarriage of tins, entailing a few erratic evolutions by Pimp resembling two loops and a nose dive, to be cut short by an unduly heavy landing on the ground. The jerk was not gentle, and the hasty descent left Pimp unable to recollect that Boche prisoners were sometimes employed on sorting out dumps.

EPILOGUE.

The Southern command had heard of Pimp's fame, his efforts at flying, fondness for sleep, so worded a minute, brief and discreet. Pimp's probation was finished, it curtly said: "Recommended for land duties only, or scrap."

It was only a dream of one active of mind, but stories have morals which the reader must find.



"Something attempted,
Something done
Has earned a night's repose."

Longfellow.

The War Will Be Won in the Air

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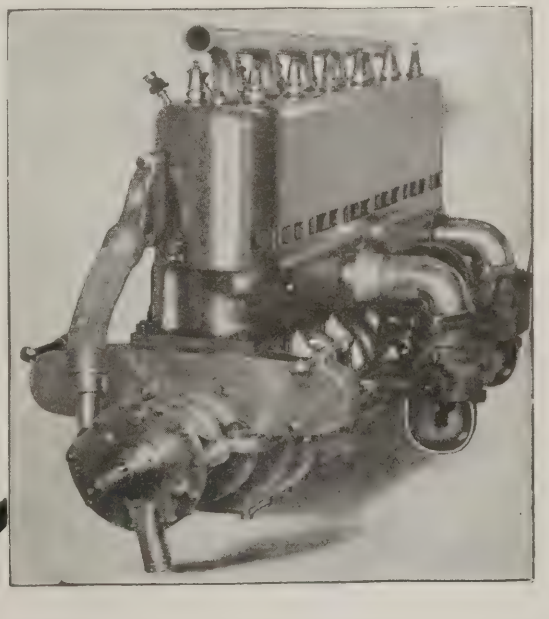
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Opinion Divided on Air Force Bill

Editorial comment in British aviation publications receives the recent Air Force Bill with varying degrees of enthusiasm. Some point out that "One Service; One Uniform; One Badge" is highly desirable, and borne out by the experience of France and Italy. France has had a separate department of the air for a long time; Italy has a High Commissioner of Aviation under the Ministry of Munitions; and Germany's aerial activity has been conducted by a centralized head for some time.

Others anticipate the period of re-organization with great apprehension and favor leaving "good enough" alone.

The Aeroplane (London) is very bitter in its attack on the Bill. It believes that

"Of the Bill itself one can only say that it is thoroughly skillfully drafted, so that it means nothing definite, so that the Government can do exactly what it pleases when the Bill becomes law, so that none can say that anything which is done later on is contrary to anything in the Act, and so that officers and men of both the Flying Services are absolutely at the mercy of the Government and its friends.

"The most striking feature of the whole performance is the fact that on this great historic occasion, when the Elect of the People were creating a great New Service, bigger than our standing Army and the Navy as well, a service on which the safety of this country will depend in future wars, a service to which the winning or losing of this present war may be due, out of some 600 and more members of the House of Commons less than 150 took the trouble to be present. It is not clear whether the absence of the other 450 or so was due to an unmerited, if touching, faith in our patchwork Government, or merely to sheer mental incapacity to understand the importance of the issues at stake. The fact remains that less than 25 per cent of our elected legislators took the trouble or had the intelligence to attend the final debate. A debate on the workingman's beer, or even on religious education, would have secured far more attention."

Flight, the official organ of the Royal Aero Club of the United Kingdom, is a strong supporter of the Bill. The editor of *Flight* believes that

"The Bill is a landmark not only in the history of aviation, but in that of the armed forces of the Crown. No longer is the aerial arm to be a mere subsidiary weapon in the hands of our commanders by sea and land, but it is by a single stroke raised to the position which has hitherto been occupied by the Navy and the Army alone. It is necessary at this juncture to say that this does not at all mean that our commanders are to be deprived of the necessary aircraft for the prosecution of their operations, nor that the aerial arm, or that portion of it which is attached to the fleets and armies operating at sea or in the field, is to be taken from under their direct command. On the contrary, and as we have pointed out times almost without number, the object of the Bill is entirely and solely to co-ordinate effort and strengthen our fleets and armies in the matter of essential aerial equipment.

"More important even than this, it is designed, and we doubt not will achieve its object, to once and for all put a stop to the ruinous competition and jealousy between the two existing Air Services. That competition and jealousy, as we have reason to know, have had a far worse effect in retarding progress and development than most people are aware of, and even the widened powers of the present Air Board have not availed to put a complete stop to it. As we have always maintained, there was only one real remedy, one panacea for the ills under which our Air Serivces suffered, and that remedy is applied by the Bill which we trust and believe will reach the Statute Book with the absolute minimum of delay."

In the editorial columns of *Flying* we find a hopeful view regarding the possibility of a harmonious development of the Royal Flying Corps and the Royal Naval Air Service under a single head. In discussing the appointment of Lord Rothermere as the head of the Air Forces, *Flying* says:

"We do not believe that he will encounter any serious difficulties in 'holding his own between the two older Services,' the Royal Flying Corps and the Royal Naval Air Service, seeing that both are engaged whole-heartedly in the supreme task of winning the war. There is no earthly reason why there should be 'any dislocation or friction with them.' The experts concerned are not politicians; they have no axe to grind; and their sole aim is efficiency. Lord Rothermere would be well advised to devote his powers of organization as a business man to the task of carrying out the advice of his technical advisers in both branches of the Air Services. It will be his duty to resist the pressure of purely political mountebanks who are utterly ignorant of the practical necessities of the war. Probably he knows as much as any living man about mob-psychology, and he may, therefore, be trusted to treat as negligible ill-informed clamor for spectacular bombing stunts at the expense of the humdrum work of the Army and the Navy. The air work of the forces in France and Flanders, in Palestine and Mesopotamia, and the air work of the sea forces which are engaged in counter-submarine and convoy work at sea must not be subordinated to the necessity of satiating popular demands for futile bombing of German towns."

Glossary of Aviation Terms

The American flyers who may be called to France and the student of aviation interested in work abroad will find the "Glossary of Aviation Terms, Termes D Aviation" of great assistance in his studies. It contains a complete glossary of practically all terms in aviation, with lists in both French and English and with equivalents in either language. The book has been compiled by Lieut. Victor W. Page, A.S.S.C., U.S.R., and Lieut. Paul Montariol of the French Flying Corps, assigned to the Instructors Department of the Signal Corps Aviation School at Mineola, which is a sufficient guarantee of its practical value. The book is of a convenient size and form, which may be carried in the pilot's pocket. The American pilot or mechanic who finds himself in France will doubtless find that the little volume will greatly facilitate intercourse with his new French compatriots. The book is not intended to serve as a dictionary, since it contains no definitions, and the reader is supposed to be already familiar with aviation. The practical value of the book is greatly increased by many excellent drawings of the various parts of the aeroplane, which are labelled both with the French and English names. Several tables are also included, giving the metric system with English equivalents, decimal equivalents of millimeters and fractions of millimeters and comparative scales of Fahrenheit and Centigrade thermometers.

"Glossary of Aviation Terms, Termes D Aviation," compiled by Lieut. Victor W. Page, A.S.S.C., U.S.R., and Lieut. Paul Montariol, French Flying Corps. This book can be obtained from The Aeronautic Library, 280 Madison Avenue, New York City. The price is $1.10 postpaid.

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4. The complete official reports of the Army and Navy Air Services and published weekly together with articles by authorities on Military and Naval aeronautics, thereby insuring to the readers and advertisers a more complete representation of Army and Navy aeronautics than is afforded by any other publication in the United States.
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Fiske Has a Plan to End German Fleet

(*Continued from page* 688)

submarine has been beaten, let us realize that the submarine is only one of many naval weapons, and that naval strategy recognizes the fact that so long as the enemy's fleet exists as a fighting force, so long as it remains what we call "a fleet in being," it constitutes a continuing menace, from which an attack of some kind may be expected at any time. For this reason, no mere subsidence of submarine activities should blind us to a desirability of sinking or disabling the German fleet.

"Germany's entire fleet is concentrated in the region of Kiel and Wilhelmshaven. All her naval eggs are in one basket, and those eggs are vitally essential to her existence as a nation. It is my profound conviction that we can smash those eggs by torpedoplane and air-bomb attacks, if we prepare and deliver them on a scale sufficiently great.

"If we do this, we shall win the latest decisive battle of the world and take the final necessary step to victory with the minimum expenditure of money and time and human life.

"Respectfully,

"(Signed) BRADLEY A. FISKE."

Aerial Trade Routes

That transportation by aeorplanes will become an important factor in trade after the war is evident from the attention that is being given the subject by members of the National Advisory Committee for Aeronautics.

France and Italy already have developed aerial mail service in a preliminary way, and Congress has made a modest appropriation to provide for the initial steps in delivery of mails by aeroplane. Now that machines have been constructed to travel a hundred and fifty miles an hour, the advantage in speed is obvious.

What about the transport of freights? Dr. W. F. Durand, chairman of the committee named above, notes that aeroplanes already have been built to carry twenty-five men and at top speed. There is no question of the ability of the aeroplane to transport commodities in quantities as great as were borne by the first railway cars constructed.

With millions of dollars now invested and vast additional sums being daily expended on aircraft for war purposes, there will be on hand when peace returns what Dr. Durand calls "an immense air capital," comprising factories, machinery and industrial organization in effective operation, with skilled workmen and an army of trained aviators.

It is well in advance to lay out trade routes and to provide for the conversion of this great investment to commercial use.—*New York Herald.*

The Four Great Airways

THE Aero Club, foreseeing the need of regulation of flying, has laid out four transcontinental routes which will be the air pikes of the country, named the "Woodrow Wilson," "Wright Brothers," "Langley," and "Chanute and Bell" airways.

The designation of routes is necessary primarily that service stations may be established along the way. The aeroplane demands more constant attention than the automobile. It must, whenever it comes to land, be examined by a mechanic who understands it. The trip from Boston to Chicago will be made in three jumps. So when the aeroplane drops to earth at Syracuse there must be not only a landing station here conspicuously marked but fuel and cover and expert attention.

Because the Aero Club is plotting the courses over which the flights will be made and describing the landmarks so that the pilot may find his way, doesn't mean that a passenger service is imminent. The busy American could make the trip from New York to Chicago in eight hours by air, and the cost should not be higher than by rail, but he will stick for a while to the slower Twentieth Century. It is the mail service that will pioneer the air routes—not that the post-office has demand for greater expedition than the railroads give but that the government can well afford to subsidize flying experiments, as it should be subsidizing new mail routes by sea.

The Aero Club is not, therefore, indulging in fancy in mapping airways. Over those airways the aviators will be carrying mails within a few years—and how long after the new vehicle has demonstrated its safety as well as its speed for mails will it be before men are traveling in it?—*Syracuse Post-Standard.*

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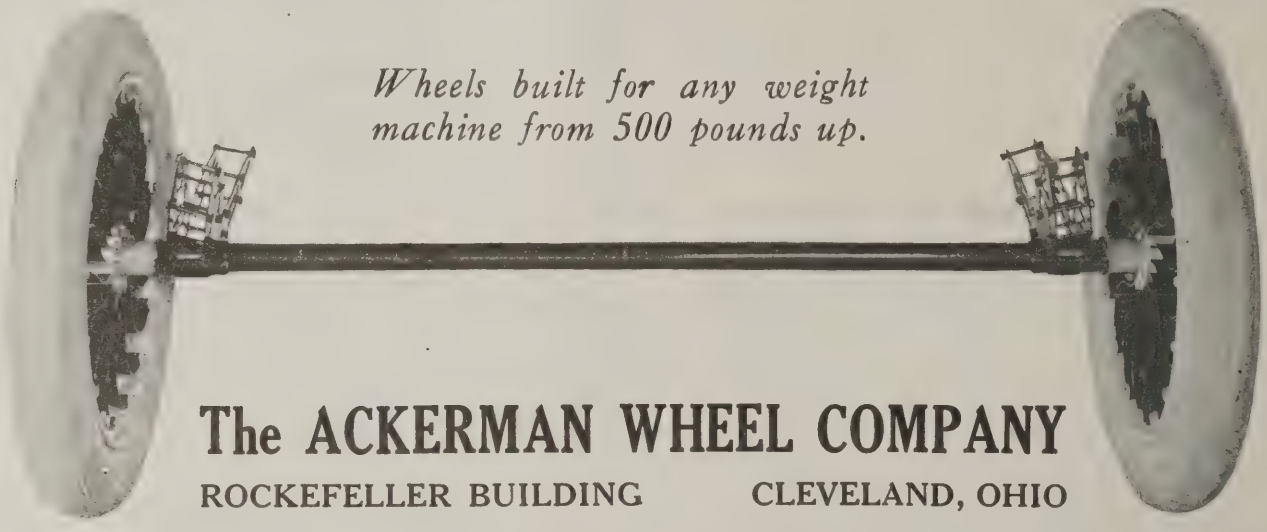
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The United States Naval Institute Proceedings Says:

"Mr. Woodhouse has been intimately associated with and interested in the advance of aviation in this country for many years, and his articles are familiar to and appreciated by most of us. His latest effort meets a long felt want, but especially so from the viewpoint of one interested in naval aeronautics, whether he belongs to any branch of the naval flying corps or to any other branch of the service. Many inquiries have been received from both officers and enlisted men asking for a book which covered the fundamentals and aims of naval aeronautics, at the same time telling what had been accomplished to date, and this book is most admirably suited for that purpose.

"It contains 260 excellent illustrations, which in themselves alone make the book valuable and which force upon the reader the realization of what has already been accomplished and what is yet to be accomplished by this country. There are innumerable books on aeronautics, practically all of which are incomprehensible to the layman, and none that cover naval aeronautics so thoroughly. This is the first book that has come to our notice which is so written that it is of value and most interesting to the novice as well as to the expert airman. Facts are told in a clear, concise, readable way, without undue use of technical terms, and yet certain chapters are sufficiently technical for the expert.

"Mr. Woodhouse enumerates the uses for which naval aircraft have been employed during the present war, and then proceeds to relate actual occurrences, which in every instance are well illustrated. Next he shows the aerial defences needed to adequately protect the United States, in comparison with what has been found necessary by Great Britain.

"For the information of the beginner there are chapters on nomenclature, administration, safety orders and regulations, Rules for the British Flying Corps, training of aviators, courses of instruction and required qualifications of personnel for the Air Service of the United States, regulations relating to enrollments in the United States Naval Reserve Flying Corps, and rules governing tests for the Federation Aeronautique Internationale Pilot Certificates.

"Of interest to everyone are the chapters discussing aeroplane guns and aerial gunnery, night flying, instruments for aerial navigation, United States Navy Aeronautics, Naval Militia Aeronautics, Aerial Coast Patrol, evolution of the seaplane and the flying boat, naval dirigibles, and other subjects."

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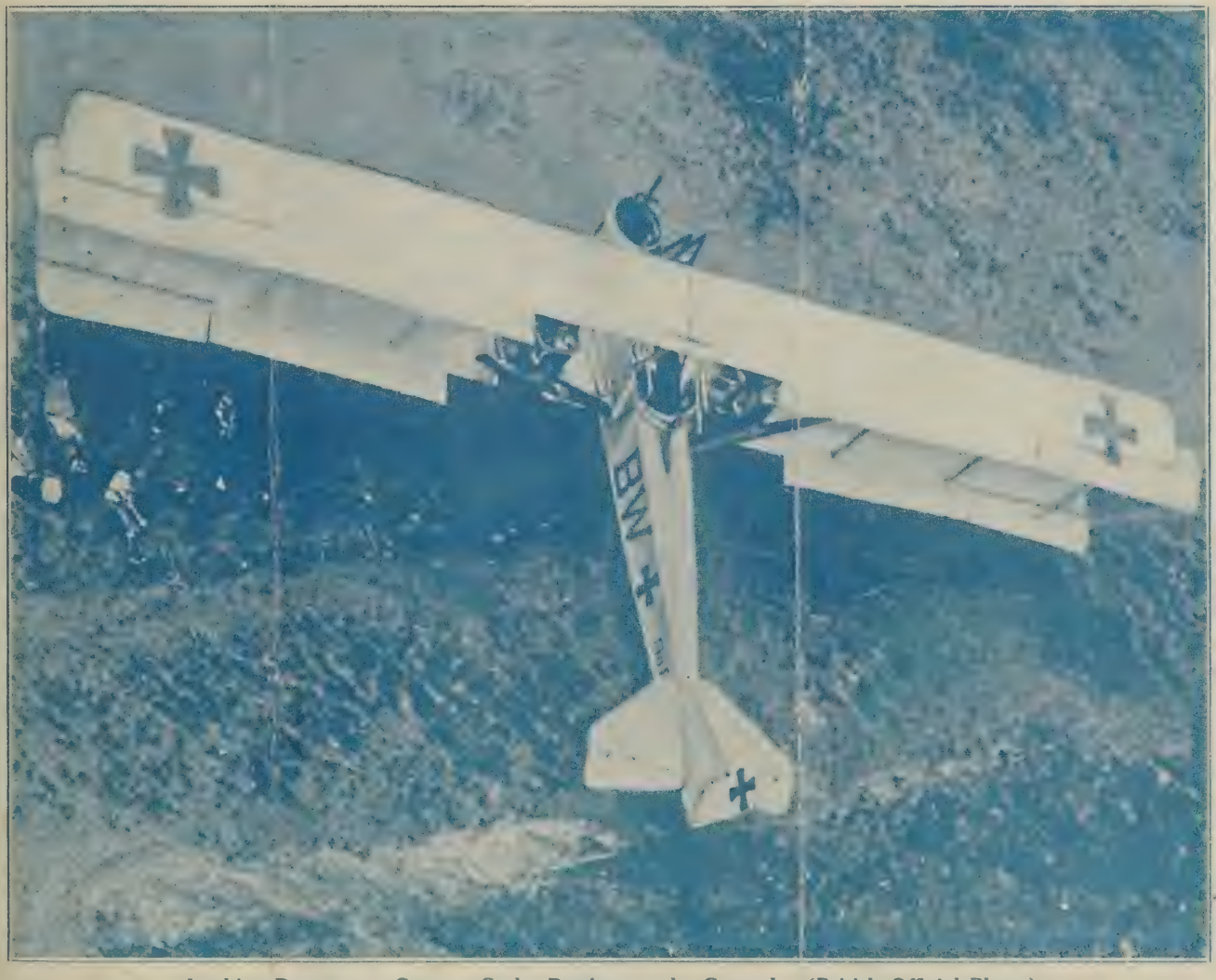
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AERIAL AGE WEEKLY

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Looking Down on a German Gotha Resting on the Ground. (British Official Photo)

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VOL. VI. NEW YORK, JANUARY 7, 1918 No. 17

TO PUT THE FEAR OF GOD IN THE GERMAN HEART

Huge Air Fleets Will Put the Fear of God Into the German Heart. Therefore, the Most Important Thing Which Every American Must Do To Win the War Is To Urge Congress To Appropriate Two Billion Dollars for Aeronautics.

POINTING out that huge air fleets will put the fear of God into the German heart, Mr. Alan R. Hawley, the President of the Aero Club of America, states that as a New Year resolution the most important thing that every American must do to help win the war is to urge Congress to appropriate $2,000,000,000 for aeronautics.

Mr. Hawley's statement follows:

"Huge air fleets will put the fear of God into the German heart. Therefore, the most important thing which every American must do to win the war is to urge Congress to appropriate two billion dollars for aeronautics.

"As President Wilson has stated repeatedly, everything that makes life worth living to the civilized world is at stake, and the civilized world is looking to the United States for the balance of power needed to win the war.

"The world's strategists have agreed that the war is to be decided in the air, in favor of the side which has supremacy of the air; and it is agreed that the United States' most important contribution is to be the contribution of tens of thousands of aviators and aeroplanes.

"To get these tens of thousands of aviators and aeroplanes and to carry out the aerial program now under way, there is needed an appropriation for aeronautics of not less than $2,000,000,000. This appropriation is needed immediately, and if given will make it possible to utilize many manufacturing resources now practically idle, and produce from 50,000 to 100,000 aeroplanes a year hereafter.

"The sum of not less than $500,000,000 is needed to build 10,000 large warplanes, and an equal amount to train the crews and put them into operation and form the Emergency Air Fleet recommended by the Aero Club of America at its annual meeting, in accordance with the following resolution adopted at the meeting:

"WHEREAS, the greatest difficulty of the Allies has been to move their forces fast enough to meet unexpected German attacks on weak points of the Allied lines, and to overcome the advantage which the Germans have of being able to transport large bodies of troops, ammunition and supplies from one part to another by interior lines; and

"WHEREAS, it is evident that powerful warplanes afford the needed combination of power and mobility in a higher degree than do any other appliances, and that the recent occupation of the Baltic Islands by Germans and the Italian reverses in the province of Venezia could have been prevented if the Allies had been able to send a sufficient number of torpedoplanes and bomb-dropping aeroplanes to assist the Russians and Italians at the first evidence of danger; and

"WHEREAS, it is generally accepted by the recognized authorities on aeronautics that aeroplanes can easily be built which can fly across the Atlantic and thereby solve the problem of delivering large units of aeronautic power to England, France, Italy and Russia, without dependence on ocean transportation, or interfering with it; and

"WHEREAS, there are in the United States unutilized manufacturing facilities and resources which could build thousands of powerful warplanes during the coming year without interfering with the present aeronautical program of the Army and Navy; and

"WHEREAS, these aeroplanes can conduct major aerial operations against the German fleet and U-boat bases, as well as against the German lines of communication and military industries and forces;

"BE IT RESOLVED, that these facts be brought to the attention of the President, the Council of National Defense, the Secretary of War, the Secretary of the Navy, the Aircraft Production Board, and to the American public, through the press, and that the coming Congress be urged to expand the present aeronautical program by appropriating not less than $1,000,000,000 for building an 'Emergency Air Fleet' of huge warplanes, and also appropriate $1,000,000,000 to carry out a comprehensive aeronautic program of training aviators and building the tens of thousands of fighting, photography, artillery and contact patrol aeroplanes, dirigibles and balloons, which are needed to assure the Allies' supremacy in the air."

This Emergency Air Fleet, supported by the fullest program

that can be carried out in every other branch of military preparedness would not only put the fear of God in the German heart, but would bring victory to the Allies in the minimum length of time, and probably cut down this costly and horrible war by a number of years.

If a thousand huge warplanes of the Trans-Atlantic size could be sent to strike at Kiel, Essen, Wilhelmshaven, Frankfort, and other important German naval and military bases, each dropping a ton or more of explosives over these German sources of military weapons, the Germans would be forced to take from their lines thousands of aeroplanes and aviators and anti-aircraft guns for the protection of every German base and city of importance, and that would weaken their forces on the various fronts and put the fear of God in the German heart.

The most important thing of all, which every American must do to help win the war is, therefore, to urge Congress to make available an appropriation of $2,000,000,000 to carry out this aerial program, and to create a separate Department of Aeronautics, its head to be a Cabinet officer, with full power to act in carrying out this program.

The activities of makers of aeroplanes, aviators and instructors, are governed by the Aircraft Board created by Congress. The Aircraft Board's activities are governed mainly by the limits imposed by the limited appropriations made available for aeronautics by Congress. To urge Congress to increase the aeronautic appropriation will, therefore, extend the activities of the aeronautic movement as a whole.

The Aero Club of America and its thirty affiliated Aero Clubs and as many co-operating organizations will continue in the coming year to concentrate their efforts in carrying out this vital program, which is to put the fear of God in the German heart.

The Flying Tank

IN an article from the pen of an eminent authority which appeared in a French contemporary a few days ago, views were expressed of the utmost importance; firstly, because they appear to us to foreshadow with accuracy closely impending developments in aerial warfare, and, next, because it is doubtful whether, had they originally been couched in the English language, they would have been granted currency by our censorship. This article is one written by M. J. Lasies, deputy for Paris, and originally appeared in the *"Matin."* In passing it may be observed that quite a number of French politicians and public men appear to be really well informed in matters pertaining to aviation and aerial warfare, in pleasing contrast to our own decidedly sorry state of affairs.

"Before now," writes M. Lasies, "I have laid stress on the urgent necessity for building bombing aeroplanes other than the inadequate machines now being used; but this does not mean that we should concentrate all our efforts on this type. The chief aim in aviation is to neglect nothing; otherwise any advantage gained in one direction is counterbalanced by delay and deficiency in another direction. For instance, our fighting scouts, which have always been superior to the German types, have often had their effectiveness curtailed by the inferiority of the machines engaged in tactical work, whose mission it is theirs to escort and protect.

"Artillery and infantry machines have been badly neglected. For long these branches of the Air Service had to be content with out-of-date Farman aeroplanes, because they were unable to get anything else. It is only just to recognize that the great efforts that have been made to remedy this deficiency have already borne fruit, and at the present time our tactical aeroplanes consist of some of the best French multi-seaters, such as the Breguet, Salmson, and Caudron R2. These machines are rendering excellent service.

"It has been conclusively shown in the war that working aeroplanes (*i.e.*, photography, artillery, and reconnaissance, as opposed to purely fighting machines) are never secure from attack by enemy fighting scouts however powerful and efficient the escort; hence the old defenseless types have been replaced by machines of distinct fighting value, capable of defending themselves by means of their own armament. The result has been that the enemy scouts are no longer wont to encounter over our lines, easy victims, which they could approach unseen, which fell to shreds the moment they tried to scrap and went down in flames at the first hit.

"Even so, design is as yet very far from final. We must have specialist machines for photographic reconnaissance and gun-spotting, and, again, for contact patrol and attack on trenches. The former must be able to fly high and fast, the latter low and slow. And for this purpose they must be armoured, in default of which they are destined to a glorious but useless end.

"The armoured aeroplane already existed in 1914, and even earlier than that. The necessity for this type of machine had been foreseen even in that remote epoch and yet it has been suffered gradually to vanish out of existence. The result is that during an attack our pilots are required to fly for hours at a time at a height of a couple of hundred feet or less over the enemy's trenches bristling with machine-guns, and this on machines which are absolutely unprotected against this point-blank fire.

"We French were the first to evolve and practice contact patrol, but as usual we are the last to utilize the only efficient means for carrying it out.

"Since several months the Germans have been using aeroplanes of the so-called "Junker" type, which is built of metal throughout, and every vital part of which, including the motor and the fuselage, is protected by bullet-proof armor. They can thus deluge with bullets our powerless infantry, and with impunity.

"Whoever knows the powerful moral effect on soldiers in the trenches of the pilot and his machine, of its roaring motor and its crackling machine gun, will recognize the imperative necessity for restoring to our Air Service a weapon which it was the first to possess, and of which it should never have been deprived. When next we attack our aviators ought to be able, so to speak, to lead their comrades on foot by the hand.

"We must build flying tanks! The Germans already have them! The reasons for our deficiency in this respect are easy to determine and as easy to put right. They are mainly due to the fact that the majority of aircraft constructors, blind to every thing but speed and ever greater speed, only build fast and therefore light machines. But a night-bomber should be slow, and a machine designed for tactical work should be armored and must, therefore, be heavy."

And let us leave our excellent French collaborator in the good cause. There is scarcely a word that he has written that is not applicable to our own case. In fact, by the mere substitution of names—which no one, we opine, will find a difficult task—the article might appear to have been written by an unbiased critic of the American Air Service.

To Kiffen Rockwell

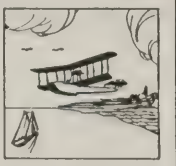
By Walter Trumbull

Wrapped in the flag for which you fought,
The Croix de Guerre upon your breast,
Sure of the truth and faith you sought,
Safe in the heart of France you rest;
One of the few who, strong of heart
When others quailed, were first to go.
Proudly you said, "I pay my part
For Lafayette and Rochambeau."

Far flew your battle monoplane,
But wider still your spirit flies.
Dear boy, you did not die in vain;
You taught us there are things to prize
Beyond life. Since you marked the way
Your countrymen assume the debt—
Rank upon rank they march to pay
For Rochambeau and Lafayette.



THE NEWS OF THE WEEK



Council of National Defense Issues Statement on Air Program

The Council of National Defense issued a brief statement which characterized the progress on the program of training 10,000 aviators and building 22,000 aeroplanes as entirely satisfactory. Aviators are under training in Egypt, Canada, England and France, as well as in the United States, and the service of Americans in the Allied armies is lauded. The report continues:

"Last Spring the Aviation Corps had less than 200 aeroplanes of all degrees of serviceability. Now a fleet of 22,000 planes is being built. When war began there were seventy-five aviators. A force of 10,000 aviators is being trained. The total personnel of the old flying corps, ground workers as well as flyers, was 2,000. The total principal of the new flying corps is 100,000.

"The first move of the board was to stop negotiations for the use of existing patents and to set men at work designing a new aeroplane engine which should comprise as many of the good points of the different patents as these men cared to use. In a week, twenty experts working together had evolved the Liberty motor, which Secretary Baker has called the greatest achievement of the war so far.

"The Liberty motor is a model of standardization. It is built with four cylinders, or with eight, or with twelve, and the same parts are interchangeable, for all three of the different sizes. The greatest automobile factories in the world have been provided with the machinery necessary for turning out these motors—the factories that have supplied the United States with its 4,000,000 automobiles when all the rest of the world gets along with only 700,000.

"It has been necessary all along not to interfere with the supply of raw materials, particularly spruce, and of certain completed aeroplane parts, to the flying forces of our allies.

"In return for these materials the Allies are giving us the rich benefit of their experience."

"Eliminate Red Tape"

President Wilson has sent to all department heads a copy of the following letter, which has been sent by Secretary Redfield to all of his assistants, and which the President heartily endorses:

"Forget how things were done before the war; eliminate red tape. We must learn with the Germans that 'the war won't wait.' Delay is the Kaiser's ally."

Daughter of Duke, Aircraft Worker

Lady Victoria Bentinock, daughter of the Duke of Portland, has been working incog in an aircraft factory, having gotten away with the "incog" successfully until King George recently visited the factory and greeted her publicly.

Virginia Legislator Joins Naval Air Force

Kenneth N. Gilpin, of Boyce County, Va., the youngest member of the Virginia Legislature, has enlisted in the Naval Reserve Flying Corps, and expects to be called to active service in the spring. It is probable that the call will not come until after the spring session of the Virginia Legislature.

How the Fiat Got Its Name

Many automobiles are named after the manufacturer, but the combination of initials which form a word is very common with the Italian makers, as witness F. I. A. T., S. P. A., S. C. A. T., etc. When the F. I. A. T. Company was formed it was decided to adopt a title which would fully explain the nature of the business and the location of the firm, and at the same time to get such a combination of initials as would form a readily-remembered word. This was no easy matter, dozens of combinations being obtained without anything satisfactory being arrived at. The best combination appeared to be Fabbrica Italiana Automobili, the initials of which gave the word Fia. This was placed on the office wall, together with a number of others, with a view of soliciting suggestions from all-comers.

Probably the word Fia would have been adopted, when some stranger entered the office and wrote after the title the word "Torino", followed by a big interrogation mark. This was a happy thought, for the factory was being established in the town of Turin, and the four initials gave the word "FIAT," a word which is easily pronounced in all tongues, which is readily understood in all languages, and which most appropriately applies to a motorcar. While a "Fabbrica Italiana Automobili Torino" car would have been just as good as a F. I. A. T., it is certain that the production would have been handicapped if it had gone forth with such an unwieldy cognomen.



Committee on Public Information

"Ground School" cadets tightening the various wire supports and preparing cockpits for pilot and observer.

Daugherty Now Instructor for Signal Corps

Earl S. Daugherty has closed his aviation school at Long Beach, Cal., in order to take up the work of instructing aviation students at the Signal Corps Aviation School at San Diego, Cal.

Chas. Hathaway, U. S. N. R. Flying Corps, Weds in Virginia

The wedding of Miss Marjorie Calley Huston, daughter of Mr. and Mrs. Abram Francis Huston of Coatesville, Penn., and Charles Hathaway, Jr., U. S. N. R. Flying Corps, youngest son of Mr. and Mrs. Charles Hathaway of 530 West End Avenue, took place at Coatesville, Va., on December 29th.



Committee on Public Information

Cadets in one of the "Ground Schools" assembling an aeroplane, thus gaining a thorough knowledge of details of construction.

Signal Corps Commissions Limited to Enlisted Men

The following is authorized by the War Department:

At present there are no vacancies in the land division of the Signal Reserve Corps, except in the grade of second lieutenant, that are not in process of being filled. It is desired and contemplated filling these vacancies in the grade of second lieutenant by the promotion of qualified enlisted men of the various subdivisions of the Signal Corps of the Army after such men have been selected for, and have satisfactorily completed, a course of instruction in the duties of an officer at a Signal Corps training camp.

It is intended to establish this training camp about January 5, 1918, and to have approximately 400 enlisted students under instruction for a period of about three months. The students for this camp will be selected by Signal Corps authorities from enlisted men of the Signal Corps, exclusive of the aviation section, under their command or observation.

It is therefore not desired to receive further applications for commission in the land section of the Signal Officers Reserve Corps.

Lieut. Pray, of Aviation Section, Marries Miss Cary

Miss Virginia L. Cary, daughter of Mrs. E. Breckenridge Cary of New York City, was married to Lieut. Thornton C. Pray, aviation section, Signal Corps, U. S. A., at Grace Church, New York City, on December 29th.

Cannon Rated First Lieutenant

B. Drummond Cannon, who was sent over by the Aero Club of America to join the Franco-American Aviation Corps last summer, has just received his commission as First Lieutenant in the American Air Service, and is now flying with our forces at the front. The letter containing this news states he is a close friend of Quentin Roosevelt, and they have been flying together on active duty. Lieut. Cannon is a graduate of Mount Pleasant Military Academy, Ossining, and he was the Adjutant of the school and qualified for appointment to West Point, but took a position as inspector at the Remington Arms Company, Bridgeport.

British Civil Aerial Transport Committee Active

In answer to a question on the floor of the House of Commons, regarding the activities of the Civil Aerial Transport Committee, Mr. Bonar Law stated that the Committee had held two meetings immediately after its formation when it was decided to divide the subjects of inquiry into five different branches to be considered by five separate committees, which altogether have held 31 meetings. A complete report of the work of the committee is to be issued in the near future.

Robert Gamble to Marry

Mr. Robert H. Gamble, Aviation Section, Naval Reserve, will be married to Miss Virginia Brooks Loney, one of the Americans who survived the Lusitania disaster. Mr. Gamble has been training in Miami, Fla., and is a graduate of Yale University. Miss Loney's father drove his own ambulance on the west front and was returning to his country home in England with his wife and daughter aboard the Lusitania on her last voyage. Miss Loney was rescued but both her parents were lost in the disaster.

Lieutenant R. B. Ward, 2d, Marries Miss Schaefer

Lieutenant R. B. Ward, A. S., S. R. C., married Miss Pauline Schaefer of Middletown, Conn. Mr. Ward is the son of the late Robert B. Ward, president of the Ward Baking Company and owner of the Brooklyn Baseball Club of the Federal League.

Mr. Ward is a graduate of Wesleyan University and a member of the Psi Upsilon fraternity. He will report for service on January 2nd.

Air Supremacy Necessary to Win, Says U. S. Senator

"Boats and more boats, aeroplanes and more aeroplanes, artillery and more artillery, are the great need of the United States and the Allies to win the war," said Senator Kenyon. "Men will be needed, too, in great numbers, but without boats, aeroplanes and artillery the war cannot be won. We must have supremacy in the air to win."

Senator Kenyon is one of the members of the Congressional Mission which recently returned from Europe where they studied war problems.

Sperry's Laboratory Assistant Joins R. F. C.

M. B. Sleeper, formerly member of the laboratory staff of the Sperry Gyroscope Company has joined the Royal Flying Corps. Sleeper has been connected with radio work for several years, having been assistant of Dr. Lee De Forest, the inventor of the Audion Detector. Later he became Radio Editor of Everyday Engineering, through which he came in contact with Mr. Sperry, who was experimenting on radio apparatus for aeroplanes.

Congressman Murray Hulbert Becomes Dock Commissioner

It is announced that Congressman Murray Hulbert, who drew up the Sheppard-Hulbert Bill and other legislation dealing with aeronautics, and who has been a strong supporter of a vigorous aeronautic program in the House, is Mayor-elect Hylan's choice for Dock Commissioner for the City of New York.

Congressman Hulbert has made a comprehensive study of the problem of the Port of New York and is remarkably qualified to fill the position requiring solution of the war problems of the port which exports aproximately two-thirds of our foreign commerce.

Secretary Redfield to Send Delegate to International Standards Conference

Secretary Redfield announced today that he had accepted an invitation from the British Ministry of Munitions to appoint delegates to the Anglo-American conference of the standardization of screw threads to be held next year.

Silk Industry Prepares to Fill Huge Demand For Aeroplane Cloth

Members of the silk industry report that manufacturers who can make the quality of cloth wanted for wings have been asked to allot a certain number of looms for this purpose.

The specifications are extremely rigid and only perfect cloth will be accepted. Consequently, from the mechanical side, the weaving will be slow and much time will be required to turn out exactly what is wanted.

As soon as the aeroplane construction plan is in full swing, and when cloth will also be needed for repairs which are necessary after practically every flight, the demands upon the silk manufacturers will be very heavy, and it is important that a reserve supply should be on hand.

Two Washington Players Join Aviation Corps

Horace Milan, utility outfielder for the Washington Americans, has joined the army aviation corps, and Billy Murray, one of the newly acquired outfielders, has joined the army quartermaster corps. Manager Griffith received their resignation from the club today.

Lord Rothermere, the New British Air Minister

Lord Rothermere, who was Mr. Harold Harmsworth, is a younger brother of Lord Northcliffe, he will be fifty next April. He has built up several large businesses, including some prominent newspapers, such as the Glasgow Daily Record, the Leeds Mercury, the Daily Mirror and the Sunday Pictorial. He has also been solely or partially concerned in such vast business concerns as the Anglo-Newfoundland Development Co.

Lord Rothermere assisted to found the Union Jack Club, of which the usefulness has been fully proved since the war; and he founded the King Edward VII. Chair of English Literature in the University of Cambridge—at present occupied by Sir Arthur Quiller-Couch.

His first step in public service was his appointment as Director of the Army Clothing Department when grave deficiencies had been discovered in that quarter, and his new appointment is doubtless partly in recognition of his success in reorganizing the department.

Lord Rothermere has suffered personally in the war. His second son died most gallantly while leading his men against the enemy a year ago. His elder son and heir has been twice wounded, and is at present serving at the front; and his third son, on leaving Eton, has joined the Royal Marines.

British Air Ministry

The following extract from a letter received recently from a prominent U. S. Army officer, who is now on duty in Europe with the United States Expeditionary Forces, gives an expression of what England has found to be necessary for the proper and efficient conduct of her vast air equipment.

"The British Government is about to create a full-fledged Air Ministry, the head of which will sit on the Treasury Bench with other members of the Cabinet, and will gradually take over full control of all aviation matters."

"Having made some inquiries on this subject in official and newspaper circles, I am certain that the bill will be passed by Parliament before the New Year by a large majority. Here is one way at least in which the British are ahead of us. But I suppose we shall have to make the same mistake they made for three years in regard to a full-fledged aeronautical department."



Signor Caproni, the world-famed Italian aeroplane constructor, whose giant bombing planes have done remarkably effective work on the Italian front.

Aluminum Plating Process Perfected

A new process of electro-plating has been perfected which is similar to that employed in plating other metals and the same uniform results and even thickness of plating are obtained. No one has heretofore been able to successfully plate aluminum on nickel, copper, silver and other metals, but the new process has been successfully applied to pure aluminum in sheets, rods, wire, tubing as well as aluminum alloyed with other metals, as for instance, is frequently employed in moulded or dye castings.

The manufacturers have found nickel plated aluminum to possess many distinct advantages, especially useful for metal parts of aeroplanes. The nickel-plated aluminum not only presents a very hard finish, capable of being highly polished, but the article plated is materially strengthened by the application of the nickel—a very desirable feature in small fragile parts such as are used in aeronautic work. Furthermore, the article can be firmly soldered by ordinary methods. It will enable the substitution of many parts now made of brass and copper for the lighter nickel-plated aluminum.

As to cost, it is claimed that the new aluminum process effects a great saving over brass and copper and will compare favorably with brass and copper, even should the price of aluminum increase at double the rate of brass or copper.

The patent rights for the aluminum plating are controlled by the United Smelting and Aluminum Company of New Haven, Conn.

(*Continued from page 746*)

h. p. Mercedes type—are placed one on each side on the centre section of the lower plane. They are enclosed in engine housings, with the radiator mounted near the nose. The main fuel tank is not carried in the engine housings, but in the pilot's cockpit, where it forms, as a matter of fact, the support for the two seats. A service tank is fitted in each engine housing, these service tanks being replenished from the main tank by means of a pump. The mounting of the engines on the lower plane centre section is somewhat unusual, and may be best understood by an examination of the scale drawings and general views. It should, of course, be studied in conjunction with the undercarriage, since much of the at first sight cumbersome and unnecessary strutting is dependent upon the design of the chassis. This, it will be seen, has been so designed that the outer wheel on each side occurs directly underneath the corresponding engine, while the inner wheel is supported on another Vee from the lower plane. The object is plainly to let the inner wheels take part of the load of the central fuselage, but the manner of carrying out the idea does not strike one as particularly ingenious. The weight of the body is during a landing primarily supported on the inner ends of the centre section of the bottom plane. Struts are taken, it is true, to the top longerons of the body, from the point of attachment of the inner chassis struts, but even so there is a considerable length of spar between this point and the sides of the body. Altogether the strutting of engines and undercarriages appears clumsy and complicated, and must, it would appear, present a great amount of head resistance. The two axles are slung from the apex of the Vees by coil springs, and not by rubber bands or cords. The speed is not known, but a rough estimate would appear to indicate as a reasonable figure about 90 m. p. h. The resistance appears to be excessive as regards certain portions, otherwise we should have estimated the speed to be slightly higher.

Wright-Martin Doubles Production

In the last three months, the Wright-Martin Corporation has doubled its daily production of aeroplane engines and has been averaging ten motors a day for several weeks. The output will be further increased when the increased facilities under construction are completed. The Wright-Martin Company is working on a large government order.

Our Boys Study Vitals of Aeros "Over There"

A whole fleet of aeroplanes, splintered by falling and sprayed with bullet holes from machine gun fire, are kept in the yard of one of our big aviation schools "over there" with the U. S. Expeditionary Forces, "Somewhere in France."

Japanese Stimulate Interest in Aviation

The Imperial Aviation Association of Japan offered three prizes, $10,000, $5,000 and $2,000, for the best motors designed and built by Japanese. The purpose of the contest was to overcome the backwardness of the Japanese in taking up aviation and lack of appreciation of the necessity of building aeroplane motors within the country itself.

The contest was held several months ago at Tokorozawa, the aviation field near Tokyo. The motors were graded according to a series of tests, which included the number of hours the motor would run effectively, the weight per horsepower, the number of revolutions per minute, the net horsepower developed, the fuel and lubricating oil consumption and the proportion of imported parts used on the motor.

Twenty-two inventors had signified their intention to enter the contest, but at the time of the contest, only three contestants appeared, presenting four motors. The official examination revealed amateurish construction and lack of experience in making the motor give the best possible showing, rather than inefficient design. The winner far outclassed the other contestants.

Both V and Rotary motors, ranging from a rated horse-power of from 70 to 100 were presented.

The winner, Mr. Shimadzu, had a 9 cylinder rotary engine. It appeared to be a close copy of the Gnome engine. It ran for 4 hours and 3 minutes and developed a maximum of 74.6 horsepower, but owing to misfiring, caused by carbon deposits, which developed in the last 7 minutes of the test, and finally caused the engine to stop, its average fell far below this figure. The number of revolutions per minute varied between 1140 and 1020.

Mr. Shimadzu also entered a 90 horsepower V-type engine, which broke down because of a defective part. It ran 2 hours and 20 minutes and developed only 34.3 horsepower at 770 revolutions per minute.

Mr. Shimadzu proposes to use the $10,000 prize to make a study of aeronautics and aeroplane motors in the United States.

Mr. Kishi entered a motor rated at 70 horsepower, but in the test was unable to develop more than 4.51 horsepower. It ran for 1 hour and 10 minutes.

The fourth contestant was Mr. Asahina, whose motor was rated at 100 horsepower. Its maximum power under test was 76.5 horsepower. According to *Industrial Japan*, the motor was of original design and showed evidences of careful planning, but the selection of materials and proportion of parts showed evidence of rather amateurish construction.

Although the contest did not show very successful results, it is certain that, by means of such encouragement as was given by the Imperial Aviation Association, that great progress will result as a matter of course.

The Principles of Aerography

Within the past few years much valuable information has been gathered concerning the exploration of the air bearing directly upon aeronautics. As a rule this is to be found only in technical scientific journals published in various languages, and has therefore been too widely scattered to be readily available to the average student. An intelligent attempt to collect such data in a single volume has been made in "The Principles of Aerography," by Alexander McAdie, Professor of Meteorology at Harvard University and the Director of the Blue Hill Observatory. The chief purpose of Aerography, the author explains, is exploration of the air with a view to utilizing the knowledge gained to insure human safety and to expedite progress. No authoritative work on meteorology has appeared for several years and the present volume therefore makes the most recent discoveries in this field available for the student. Special attention is paid in the present work to cloud forms and the thermo-dynamica of their formation and dissipation, while stress is laid upon modern methods of attack and the practical application of the knowledge already available. The average reader will find the book exceedingly interesting, opening up many new lines of investigation of which he doubtless has little conception.

The Principles of Aerography, by Alexander McAdie. This book is obtainable through The Aeronautic Library, 280 Madison Avenue, New York City. The price is $3.25 postpaid.

NAVAL and MILITARY AERONAUTICS

Special Orders 290

The following-named officers of the Medical Reserve Corps are relieved from duty at the Aviation School, Mount Clemens, Mich., and will proceed to San Antonio, Tex., and report in person to the commanding officer, Aviation School, Kelly Field, that place, for duty, and by letter to the Chief Signal Officer, in Washington, D. C.; Capt. Howard W. Stuch, First Lieut. Harry E. Brown, First Lieut. John W. Thompson.

The following applications for commissions in the Aviation Section, Signal Reserve Corps, have been approved at the office of the Adjutant General: To be Majors, Av. Sec. Sig. Reserve Corps: Morton Dale Stone, Norman Milton Roblee, Victor Clark Parker and Thomas Watkins Campbell.

To be Captain: Av. Sec. Sig. Reserve Corps: Lee Wellington Oldfield.

To be First Lieutenants, Av. Sec. Sig. Reserve Corps: Harold G. Schweser, Homer E. Whitney, Otho Leon Sifford, George Parker Miller, Frank W. Macomber, Wybro B. Griffiths, Charles E. Butner, William Phillip Bates, Edward Butts, Jr., Ernest A. Love, Harry B. Hartman.

To be Second Lieutenants, Av. Sec. Sig. Reserve Corps: Francis Byron Wasserboehr, Charles Howard La France, and William Earl Dickinson.

To be Captain, Signal Reserve: Edwin Bower Hesser.

To be Second Lieutenants Signal Reserve: Frank Le Roy Blood, Morgan Hebard, Thomas Earl McConnell, Kenneth Henderson Sloan and Charles Ivan Reid.

Extract S. O. 290-291

Major Edmund R. Andrews, Sig. Corps, to Berkeley, Cal., Austin, Texas, and Atlanta, Georgia, for the purpose of making inspection of methods of instruction in signaling, upon completion to report to the Chief Signal Officer of the army for duty.

Second Lieut. Anthony J. Balon, S. C., to Kelly Field, San Antonio, Texas, for duty.

Captain Roger Amory and First Lieut. Carl D. Matz, Av. Sec., S. R. C., detailed members of aviation examining board.

Temporary Second Lieutenants, Amos L. Piper and Gordon L. Rice, Signal Corps, to Kelly Field, San Antonio, Texas, for duty.

First Lieut. Joseph Horchow, 145th Infty., National Guard of the United States (Ohio) to School of Military Aeronautics, at Austin, Texas, for course of instruction in aviation.

Captain John F. Dillon, S. R. C., to duty as supply officer, Signal Corps general supply depot, Ft. Mason, Cal., and Signal Corps superintendent of Army Transport Service, San Francisco, Cal., relieving Lt. Col. Frank Greene, U. S. Army, retired, who upon being relieved will report to the commanding general, Western department, for duty as signal officer of that department.

First Lt. B. F. Mostowski, S. R. C., active duty reporting to Chief Signal Officer, for assignment.

Temporary First Lt. John H. Wade, S. C., to Chief Signal Officer for assignment.

First Lt. Henry Bullock, S. C., to Portland, Oregon, for duty.

First Lt. Roy N. Francis, Av. Sec., S. R. C., duty requiring aerial flights from Nov. 16, 1917.

The appointment of Captain Wilford Danvers, S. R. C., as Major, Signal Corps, with rank from December 10th, 1917, is announced.

The appointment of First Lt. Milton N. Williams, S. R. C., as Captain, S. R. C., with rank from December 10th, 1917, in announced.

The following named officers, Av. Sec., S. R. C., announced as on duty in aerial flights: First Lt. Rex P. Arthur, Dec. 4, 1917. First Lt. Maurice G. Cleary, Dec. 3, 1917.

First Lt. William L. Moffat, Jr., S. R. C., duty with War College Division, with station at New York, N. Y.

First Lt. William H. Noble, Field Artillery, Reserve Corps, to School of Military Aeronautics, at Austin, Texas, for duty.

Captain Karl Kinsley, Av. Sec., S. R. C., to Chief Signal officer of the army for assignment.

Major Wrisley Brown, S. R. C., active duty reporting to Chief, War College Division, for assignment.

Special Orders 292-293

The following named officers, with rank from December 1 is announced: To be Colonel, Lt. Col. Clinton G. Edgar, Signal Corps, Air Section. To be Lt. Cols., Major Frank B. Jewett, Signal Reserve Corps, Air Section; Lt. Major Nugent H. Slaughter, Signal Reserve Corps, Air Section.

First Lt. William M. Halley, Av. Sec. S.R.C., to Morrison, Va., for duty.

Second Lt. Clarence Denton Tuska, Av. Sec., S. R. C., report to Chief Signal Officer for duty.

Lt. Col. John C. Groome, S. C., to Chief Signal Officer for duty.

The appointment and promotion of Second Lt. Richard E. Sands, 337th Field Art., to the grade of First Lt. Signal Corps, Regular Army, with rank from December 5 is announced.

Second Lt. J. J. Regan, Jr., Coast Artillery Corps Reserve, is relieved from duty at the School of Military Aeronautics, Austin, Texas, and will report to Ft. Howard, Md., for duty.

Second Lt. Manfred A. Parkes, Av. Sec., S. R. C., to Portland, Oregon, for duty.

Captain Henry B. Joy, Sig. Corps, temporary) promoted to Lt. Col. Sig. Corps, (temporary) with rank from December 11, 1917, is announced.

First Lt. Roland S. Tait, Av. Sec., S. R. C., to Balloon School, Ft. Omaha, Neb., for duty.

First Lt. Edward E. Sirlee, Av. Sec., S. R. C., to Army Balloon School at Ft. Omaha.

First Lt. Eugene B. McDonald, S. R. C., to Little Silver, N. J., for duty.



Col. Wm. D. Chilly, commanding officer, Kelly Field, South San Antonio, Texas.

First Lt. G. Raymond Richmand, Av. Sec., S. R. C., to active duty reporting at School of Military Aeronautics, Austin, Texas.

Maj. William Logan Martin, Av. Sec., S.R.C., active duty, reporting to C. S. O. for duty.

First Lt. Oscar V. Vatet, Av. Sec., S.R.C., to Garden City, L. I., N. Y., for duty.

First Lt. Alfred Grimm, Av. Sec., S.R.C., to Army Balloon School at Ft. Omaha, Neb.

Second Lt. Vernon Edward Daniels, Av. Sec., S. R. C., to Chief Signal Officer of the Army for duty.

Lt. Cols. William L. Patterson and Virginius E. Clark, Junior Mil Aviators, Signal Corps, are rated Military Aviators from September 17, 1917.

Lt. Col. John B. Christian, Sig. Corps, to duty at Camp Samuel B. Morse, Leon Springs, Texas.

First Lt. Ted C. Vella, S. R. C., to New York, N. Y., for station.

Second Lt. Frank Clarence Franzen, Av. Sec., S. R. C., active duty reporting to Chief Signal Officer for assignment.

Capt, Harry Bertine Meller, Av. Sec., S.R.C., active duty on examining board at Pittsburgh, Pa., for temporary duty.

Paragraph 11, Special Orders, No. 279, War Department, November 30, 1917, relating to First Lt. Bernard T. O'Rourke, Aviation Section, S. R. C., is amended so as to read First Lt. Bernard J. O'Rourke, Aviation Section, S. R. C.

First Lt. Edward King, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will report to the officer in charge, physical examining unit. Aviation Section, Signal Corps, Cincinnati, Ohio, for duty as medical member of examining board and recruiting officer, and by letter to the Chief Signal Officer, Washington, D. C.

The following-named officers of the Aviation Section, S. R. C., are assigned to active duty and will report to the commanding officer, Kelly Field, San Antonio, Texas, for assignment to duty: First Lt. Philip E. Devant, First Lt. Edmund B. Frye, Jr., First Lt. Gilvie Hubbard, First Lt. Sam J. Smith, First Lt. Raymond S. Dickinson, First Lieut. Frederick J. Chapin, First Lt. Jeff D. Gautier, First Lt. James C. Clark, First Lt. John H. Kendall, First Lt. William A. Haile, Jr., First Lt. Chester J. McPhesters, First Lt. Sam V. Stone, First Lt. Art. V. Wortman, First Lt. August B. Sammons, First Lt. David C. Proctor, First Lt. Louis R. Cook, First Lt. George A. Cunningham, First Lt. Raymond J. Sauter, First Lt. John F. Patterson, First Lt. Oscar P. McChord, First Lt. Champ C. Carter, First Lt. George H. DeKay, First Lt. Harford W. H. Powell, Jr., First Lt. William B. Joyce.

Second Lieut. Harold Gray Mead, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for duty.

Second Lieut. Carleton A. Parker, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for duty.

Second Lieut. Francis Fleming Taggart, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for duty.

Second Lieut. Albert Lynn Hopkins, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for duty.

Second Lieut. James Ignatius Barry, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

Second Lieut. Cecil Wright Mason, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

Second Lieut. Eugene Augustus Riggs, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

Second Lieut. George Henry Scragg, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

Second Lieut. Earl Evert Ives, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

Second Lieut. Edward Patrick Reiner, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for assignment to duty.

The following-named enlisted men, Signal Corps, upon completion of their course at the school of military aeronautics and graduation with their classes will be sent to the Army Balloon School, Fort Omaha, Nebr., for the course of training and instruction in ballooning:

Texas State University, Austin, Tex.: G. C. Brown, Stanley Dolch, J. S. Donaldson, Nelson Goodenough, Rufus T. Martin, C. E. Hartford; Georgia Institute of Technology, Atlanta, Ga.: D. Milligan, C. T. Roberts, V. H. Burgin, W. C. Maxwell, P. P. Steinhart, Fairfax K. Dillon; Cornell University, Ithaca, N. Y.: G. H. Kenyon, L. F. Paszek, L. R. Robbins, H. D. Smith, G. H. Schanfield, Abott Markell.

Lieut. Col. Larue D. Carter, Medical Corps, National Guard of the United States, is hereby granted leave of absence for five days, commencing December 17, 1917.

Special Orders 294-295

First Lieut. Raymond E. Vaughn, Av. Sec. S. R. C., is relieved from duty as member of board of officers appointed in par. 31, S. O. 244, Oct. 19,1917.

Maj. Ralph P. Cousins, Av. Sec. S. C., will report to the Chief of Staff for duty.

Maj. Cedric A. Rebadow, Av. Sec. S. R. C., to active duty, reporting to Chief Signal Officer for duty.

Second Lieut. Percy G. Scull, Av. Sec. S. R. C., active duty reporting to Chief Signal Officer of the Army for assignment.

First Lieut. Samuel L. Walden, Av. Sec. S. R. C., active duty, reporting to Chief Signal Officer of the Army for assignment.

Second Lieut. Howard F. Tilson, Infantry Reserve Corps, to active duty, reporting to commanding officer of the Military School for Aeronautics, Texas State University for aviation training.

First Lieut. C. H. Amon, Av. Sec. S. R. C., active duty reporting to C. S. O. of Army.

The temporary detail by the President of Lieut. Col. Laurence C. Brown, S. C., as Colonel in that Corps, from September 23, 1917, is announced.

Second Lieut. W. A. Turner, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Second Lieut. William C. Petry, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. J. A. Johnson, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Second Lieut. Earl V. Higbee, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

First Lieut. Charles W. Babcock, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Capt. Frank H. Nichols, Av. Sec. S. R. C., is assigned to active duty and will proceed to the aviation examining board, San Francisco, Cal., for three days' temporary duty, and upon the completion thereof will return to Los Angeles, Cal., and take station as a member of the board of officers appointed in letter orders from the Adjutant General dated December 13, 1917. The travel directed is necessary in the military service.

First Lieut. William V. Fiske, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer, Washington, D. C., for duty.

First Lieut. Versile M. Gates, Medical Reserve Corps, is assigned to active duay and will proceed to Fort Oglethorpe, Ga., and report in person to the commandant, medical officers' training camp, Camp Greenleaf, that post, for a course of instruction. The travel directed is necessary in the military service.

Capt. Robert M. Bennett, Medical Reserve Corps, is assigned to active duty, to take effect at such time as will enable him to comply with this order, and will proceed to Fort Riley, Kans., and report in person on or about January 10, 1918, to the commandant, medical officers' training camp, that place, for a course of instruction. The travel directed is necessary in the military service.

First Lieut. Leo M. Czaja, Medical Reserve Corps, is assigned to active duty and will proceed to Fort Oglethorpe, Ga., and report in person to the commandant, medical officers' training camp, Camp Greenleaf, that post, for a course of instruction. The travel directed is necessary in the military service.

First Lieut. Charles H. Manning, Dental Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Ice Plant Company No. 301, Camp Merritt, N. J., for duty.

Second Lieut. George L. Tomlinson, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Second Lieut. Edward J. Malone, jr., Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Capt. Luman T. Thurber, Av. Sec. S. R. C., is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty. The travel directed is necessary in the military service.

Capt. Charles C. Merz, Av. Sec. S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

The following-named officers of the Signal Corps, recently detailed, are relieved from their present duties and are assigned as follows:

Maj. J. Alfred Moss will proceed to Charleston, S. C., and report in person to the commanding general, Southeastern Department, for assignment to duty as assistant to the signal officer of that division.

Maj. Charles F. Leonard will proceed to San Francisco, Cal., and upon arrival report by telegraph to the Adjutant General of the Army for further orders.

Maj. Joseph F. Ware will proceed to Little Silver, N. J., and report to the commanding officer, Camp Alfred Vail, for duty.

Capt. Louis D. Bender will proceed to Fort Leavenworth, Kans., and report to the commandant, Signal Corps training camp, for duty.

The travel directed is necessary in the military service.

The following appointments in the Officers' Reserve Corps and National Army have been made in the office of the Adjutant General this date:

To be Captain, Aviation Section, Signal Reserve, Roy Jennings MacKenzie.

To be First Lieutenants, Aviation Section, Signal Reserve: Alan C. Cameron, Lyman Edwin Case, John F. Burton, William J. Creighton, George Sawyer Clark, William I. Daniell, William M. Heftye, William E. Nieman, Ralph E. Davison, Arthur F. Seaver, Edward P. Howard, Thomas J. Lenihan, Kenneth C. Leggett, Frank W. Tillman, William Howard Bretting, Hilbert L. Bair, John J. Elliott, Grenville L. Hancock, Oliver P. Gothlin, Marshall S. Boggs, Paul S. Cox, Henry Romer Ellis, Harold Gray Osborn, Malcolm M. Mitchell, Carrol F. Watson, Her-



A twin-motored French Caudron. (French Official photo.)



CANADIAN MEMBERS OF THE ROYAL FLYING CORPS

(1) Capt. Doré. (2) Major Sherrién, who shot two Germans before being in service 20 hours. (3) Lieut. Barlow. (4) Lieut. J. Acton.

man Victor Boley, Alander F. Hogland, John W. Williams, Leland Vining Clark, Walter O. Davis, Henry A. Sutton, Harris Percy Alderman, J. Cecil Leonard, William J. Blackman, Eno Campbell, James Harvey Ackerman, Stephen Tracy Webster, William Austin Brown, John C. Davidson, Eugene Paul Wubben, Joseph Emmet Beauton, Howard Binley, Walter X. Young, Richard E. Lloyd, Edmund T. Allen, John M. Johnson, Morgan B. More, Henry R. Ellis, Byron Turner Burt, Jr., Rowland F. Potter, Harry Jenkinson, Jr., Leight Wade, Francis James Connelly, James Alfred Keating, George Clarke Squires, Henry O. Starkey, Don Ryan Harris, Russell Henry Pedler, Eugene Russell Wheatley, Jay I. Carpenter, Ralph Scribner Schmitt, Walter Blaine Wanamaker, Lawrence Landon Smart, Oliver John Hall, Miner Carey Markham, Vincent J. Meloy, Davis Logg, Edward Elliott, James Donald Clearwaters, Daniel W. Cassard, Frank Benedict Bainbridge.

To be temporary Second Lieutenant, Signal Corps, R. A., Edward Eugene Bouchard.

The following appointments in the Officers' Reserve Corp have been made in the office of the Adjudant General this date:

To be Captain Signal Reserve: Raymond J. Littlefield, Wells River, Vt.

To be Second Lieutenants Signal Reserve: Charlie R. Sullivan, care of Military Attache American Embassy, Mexico City, Mex.; Joseph L. Koehl, Apt. 405 6th & E Street, N. W., Washington, D. C.

To be Majors Aviation Section, Signal Reserve: Joseph F. Bell, 535 Wales Avenue, New York, N. Y.; Samuel William Ramsey, 2641 Victor Street, Kansas City, Mo., Earl Clair Zoll, 394 Crawford Street, Detroit, Mich.; Abram Leonard Ellwood, 1608 McGee Street, Kansas City, Mo.

To be Captain Aviation Section, Signal Reserve: Charles Marion Armstrong, Conklin Street, Farmingdale, N. Y.

To be First Lieutenant, Aviation Section, Signal Reserve: Louis Edward West, 30 Capitol Avenue, Bridgeport, Conn.

To be Second Lieutenants, Aviation Section, Signal Reserve: Thomas J. Gannon, Milan, Ill.; Frank William Kemp, 19 Bremen Street, Buffalo, N. Y.; Edward Rufus Deichart, 508 12th Street, N. W., Washington, D. C.; Elmer A. McCullough, 2408 Maplewood Avenue, Toledo, O.; Frederick Acker Palmer, Jr., 1334 Maryland Avenue, Washington, D. C.; Frederick Watkins State, 126 North Sunset Avenue, Dayton, O.; Frank Douglass Gibbs, 1321 Trumbull Street, Detroit, Mich.; John A. Sink, 2630 North Illinois Street, Indianapolis, Ind.; Daniel Arthur Brooks, Statler Hotel, Detroit, Mich.; Edwin H. Loewus, 1882 Converse, New York, N. Y.; Will Waldemar Hubenet, 524 Bainbridge Street, Brooklyn, N. Y.; Alvin J. Schaub, 3012 Jefferson Avenue, Cincinnati, O.; Frank J. Murphy, 119 D Street, N. E., Washington, D. C.; Frank Duncan Kelley, 493 Woodward Avenue, Detroit, Mich.; Charles H. Paxton, 111 Seyburn Avenue, Detroit, Mich.; Glenn Morris Longstreet, 1702 Detroit Avenue, Lakewood, O.; Plimon Henry Dudley, Saugatuck, Mich.; Tom Barry Miller, 119 D Street, N. E., Washington, D. C.

To be Temporary First Lieutenant, Signal Corp, R. A.: William T. Adams, Signal Corp, Concentration Camp, Garden City, L. I., N. Y.

Extract S. O. 298

Temporary Second Lieutenant: Robert M. Foster, Av. Sec., Signal Corp, active duty, Kellyfield, San Antonio, Tex.

First Lt. Hugh Lowery, Av. Sec., S. R. C., active duty, Aviation Depot, Garden City, L. I.,

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First Lt. Charles E. Lyons, Av. Sec., S. R. C., active duty at Fort McPherson, Ga.

First Lt. James W. Oglesby, Jr., Av. Sec., S. R. C., active duty at Portland, Ore.

First Lt. Whorton E. Weems, Av. Sec., S. R. C., active duty, reporting to Chief Signal Officer of the Army for assignment.

First Lt. David G. Boyd, Av. Sec., S. R. C., active duty at Army Balloon School, Fort Omaha, Neb.

The following named officers of the Medical Reserve Corp assigned to active duty with the Aviation Section, Signal Corp, at Greenville, S. C.: First Lt. Marmaduke H. Denslow, First Lt. George E. Flinn and First Lt. Robt. W. Schilling.

Captain W. K. Evans, S. R. C., is relieved from further active duty and will proceed to his home.

First Lt. Henry E. Wulburg, Av. Sec., S. R. C., active duty at Parkfield, Millington, Tenn.

The appointment of Second Lt. Frederick I. Eglin, Second Indiana Infantry, to the grade of First Lt. (temporary), in the Signal Corp of the Regular Army, with rank from December 15, 1917, is announced.

The following named officers of the Medical Reserve Corp are assigned to active duty with the Aviation Section, S. C., at South San Antonio, Tex.: First Lt. Houston C. Chambers, First Lt. Charles Chapin, First Lt. Edmun Eastwood, First Lt. Frank A. Lowe, First Lt. Robert C. Meadors, First Lt. Harry W. Schofield and First Lt. Charles P. Chaffin.



A squadron of French Brequet bombing machines. (French Official photo.)

THE GERMAN A.E.G. BOMBING BIPLANE*

IN THE early days of the war it was the habit of the lay Press to use the name Taube for all military machines of German origin, and this caused some confusion in sometimes spreading the impression that the machines which figured in reports of fights in the air were of the Taube monoplane type, when, as a matter of fact, this type of aeroplane had long since been abandoned by the Germans. In the same manner there would at the present moment appear to be the possibility of causing some confusion by assigning to all German aeroplanes carrying out bombing raids on England the designation "Gotha." As a matter of fact, it must not be assumed that these raiders are necessarily always of the Gotha type, as Germany possesses others which would in all probability be capable of such raids, for which they with some amount of probability may be assumed to have been used. We are referring to the large twin-engine biplanes built by the Allgemeine Elektrizitäts Gesellschaft, and known as A. E. G. biplanes.

The A. E. G. firm was, perhaps, one of the first in Germany to turn its attention to machines of large dimensions, although not to such extent as the Capronis in Italy or the Handley-Pages in Great Britain. One of the first A. E. G. twin-engine biplanes to become known to pilots on the western front made its appearance during 1916, and was briefly described by M. Jean Lagorgette in our French contemporary *l'Aérophile* of August, 1916. This machine had a long covered-in fuselage providing accommodation for the pilot and gunners, while the two engines were placed on the wings, sufficiently far out for the two tractor screws to clear the nose of the fuselage. The planes, of which the upper was slightly longer than the lower, were set at a dihedral angle, and were also swept back in the manner beloved by German aeroplane designers. Little was known of these machines, except that they were believed to be made almost entirely of steel.

The following particulars of the 1917 type A. E. G. bombers may be of interest, since, as already mentioned, there is a possibility of these being employed for raids on England as well as the Gothas. The general arrangement will be clear from the accompanying perspective views and scale drawings, which latter should not be very far wrong in any dimension, although their absolute correctness cannot be guaranteed. They have been plotted with the aid of the perspective views, with which they tally fairly accurately.

Fundamentally the A. E. G. bomber resembles the Gotha biplanes, illustrated descriptions of which were published in our issues of August 13 and September 24, 1917. In dimensions, however, the two machines differ considerably, the Gotha being somewhat larger. Also the A. E. G. has its two airscrews placed in front of the main planes, whereas in the Gotha they are "pusher" screws. As in the Gotha, the wings of the A. E. G. are swept back at a 5° angle and are also placed at a dihedral angle, which appears to be greater in the bottom than in the top plane. The span, it will be seen from the scale drawings, is the same for both planes, and amounts to 57′, while the overall length is about 30′ 6″; chord, 7′ 0″; area 800 sq. ft.; gap, 8′ 6″—7′ 5″. The ailerons, which are of a peculiar shape, are fitted to the top plane only, and are operated by a crank lever working in a slot in the plane as shown in one of the accompanying sketches. This arrangement, which will be familiar to our readers from descriptions of Albatross biplanes, would appear to be in general favor with German designers, whereas it is rarely or never met with in Allied machines.

The tail planes, which are of the monoplane type, consist of fixed stabilizing planes with an area of 30 sq. ft., and a vertical fin, to which are hinged the elevators and rudder respectively. Both elevators and rudder have forward projections in order to partly balance them, thus relieving the pilot of a certain amount of the strain of working the controls. Maximum height of rudder, 6′ 9″; area 17 sq. ft.; maximum span of elevators, 12′ 0″; total area, 25 sq. ft. A tail skid is fitted under the stern of the fuselage, and is sprung, not by means of rubber shock absorbers as is usually the case with our machines, but by means of coil springs. The same is the case with the landing chassis, where coil springs are also used instead of rubber. Whether this "indicates a shortage of rubber" in Germany, or whether, for machines of such large dimensions and heavy weight, it has been found more suitable, it is not possible to say.

As already mentioned, the material used in the construction is, with very few exceptions, steel, practically the only parts made of wood being the ribs of the main planes. The main spars are in the form of steel tubes, which is rather surprising in view of the fact that about the worst use to put a circular or tubular section to is to employ it as a beam laterally loaded, since much of the material of such a section will be situated at or near the neutral axis, where it is adding weight without contributing greatly towards the strength. Possibly the tube has been chosen, in this instance, for reasons connected with the manufacture rather than from considerations of structural suitability. The method of attaching the root of the main spar to the centre section of the top plane is shown in one of the sketches. The short length joining the centre section spar and root of wing appears to be turned from the solid, hollowed out at one end to receive the centre section spar, and having machined on the other a forked end to receive the root of the main spar. The strut socket, which resembles those usually found on German machines, is attached to it by welding.

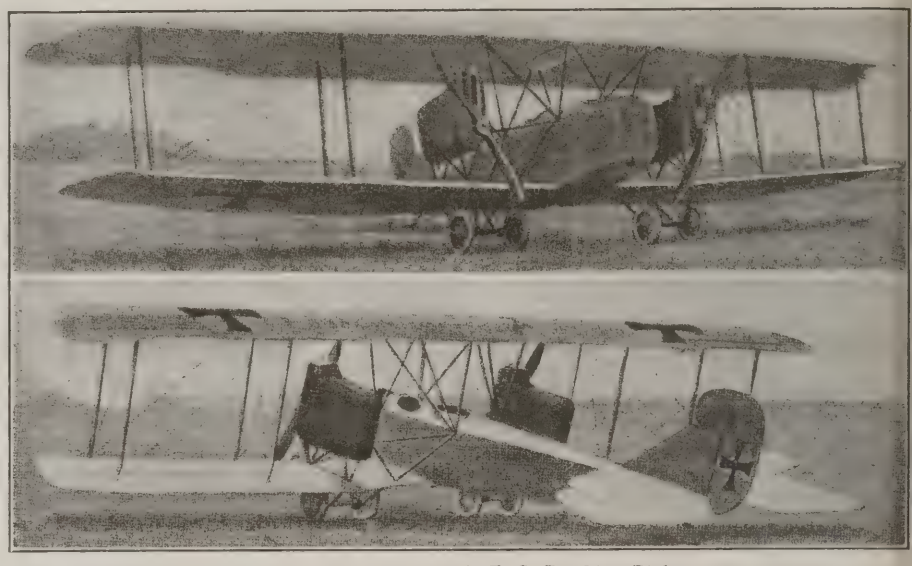
Like the rest of the machine, the fuselage of the A. E. G. bomber is built up of steel tubes, this material being used for longerons as well as for struts and cross members. These are connected by welding and the joints are stiffened and anchorage provided for the cross bracing wires by triangular pieces of sheet steel welded to longerons and struts. The arrangement will be better understood by reference to one of the accompanying illustrations.

With regard to the accommodation for the occupants, this is divided into three divisions. In the front cockpit—at the extreme nose of the body—is a seat for the bomber, who views the ground below and obtains his sights through a circular opening in the floor. On his right the bomber has a rack holding bombs; these are presumably not of a very heavy calibre. Under the centre of the body there is another bomb rack carrying the heavier projectiles. Near the inner ends of the lower plane there are fittings for an additional supply of bombs. The majority of the bombs, however, are not, so far as it is possible to ascertain, carried under the body and wings, but inside the body.

In the centre cockpit there are two seats, side by side, occupied by two pilots, or presumably by two pilot-gunners, one relieving the other at the controls during a long flight. The two seats, although placed side by side, do not extend the whole width of the body, but are placed a little to the left of the centre line, leaving room on the right-hand side for a bomb rack holding about 10 or 12 bombs. Behind the pilot's cockpit is that of the gunner, who operates a machine-gun mounted on a turntable, which allows of firing the gun laterally as well as upwards and to the rear. On the left-hand side in the gunner's cockpit there is another bomb rack carrying a similar store of bombs to that in the pilot's cockpit. In the floor of the bay to the rear of the gunner's cockpit there is a trap door, hinged along its rear edge. By lifting up this trap door, which may be held in its open position by a catch, the gunner is enabled to fire in a downward and rearward direction when being chased and attacked from behind. A small gun pivot mounted on the floor forms the support for the gun when firing through the trap door.

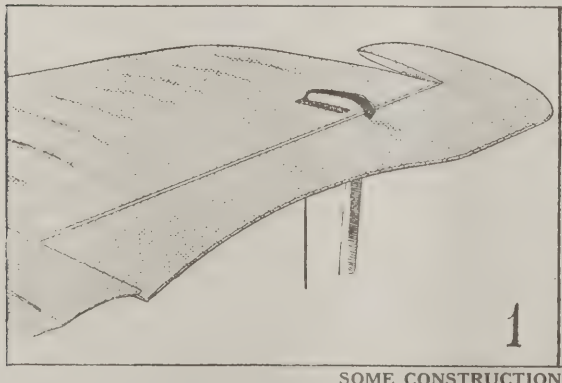
The engines—which are generally of the 260

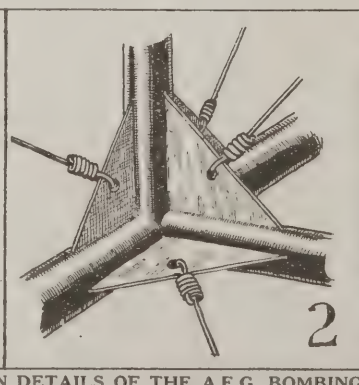
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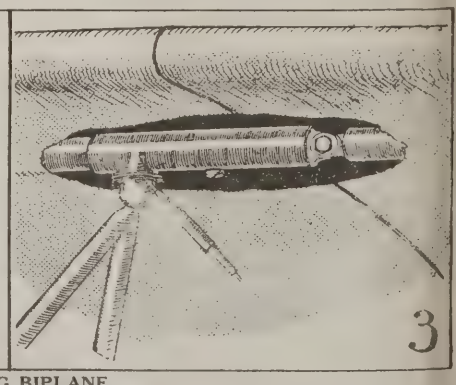


Two views of the German A. E. G. Bombing Biplane

* Courtesy of *Flight*, London.



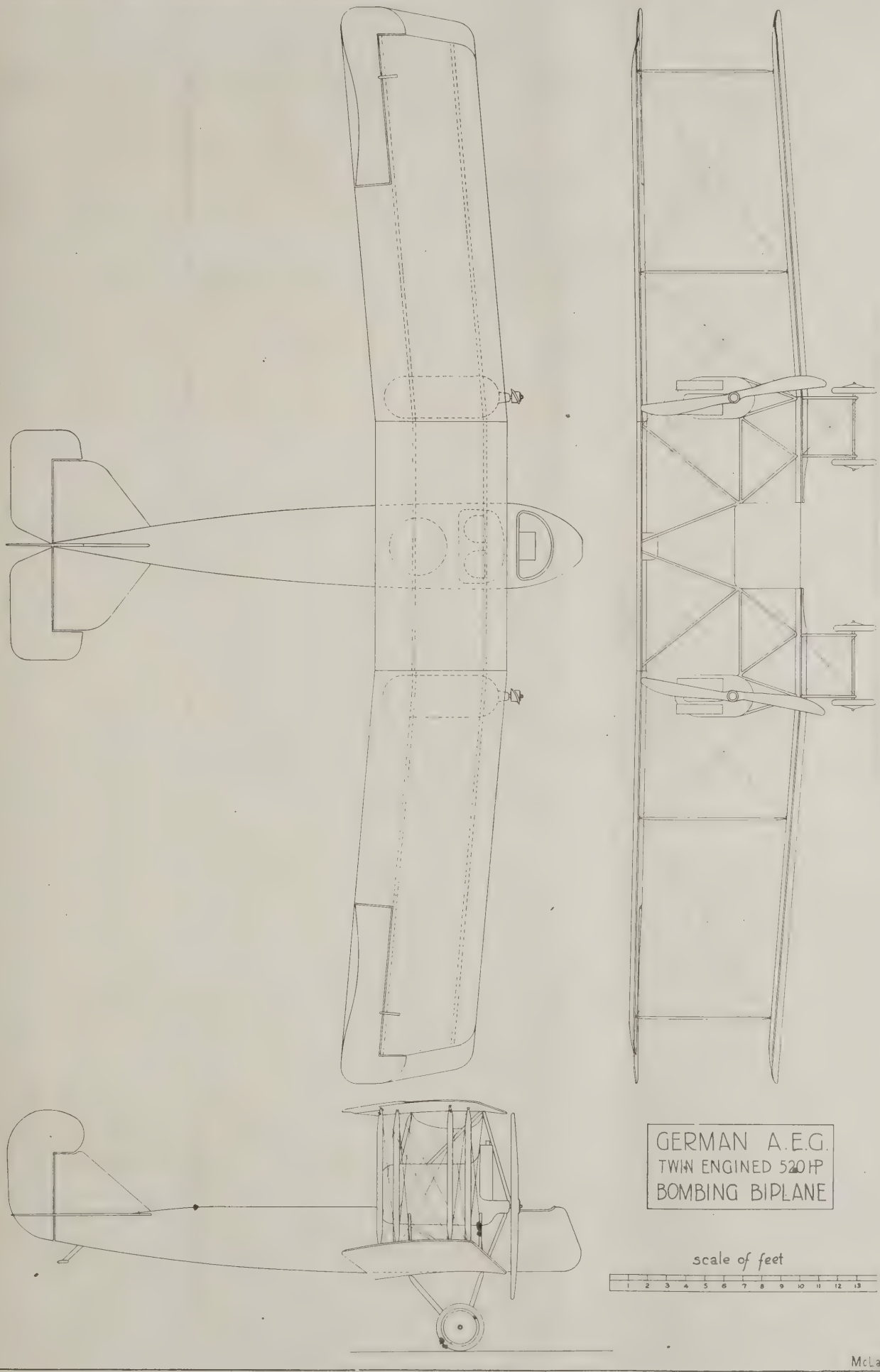




SOME CONSTRUCTION DETAILS OF THE A.E.G. BOMBING BIPLANE

1—One of the ailerons, showing the operating crank. 2—The tubular fuselage construction.

3—Attachment of the outer to the central sections of the top plane.


GERMAN A.E.G.
TWIN ENGINED 520 HP
BOMBING BIPLANE
scale of feet
1 2 3 4 5 6 7 8 9 10 11 12 13
McLaughlin

"La théorie en Aviation doit être enseignée non par des ingénieurs de laboratoire, mais par ceux qui ont conçu et realisé les meilleurs appareils, car, en Aviation, la théorie même tient encore de l'empirisme: elle est de l'empirisme scientifique" ROLAND GARROS.

AEROPLANE CONSTRUCTION IN GENERAL

Criterions in Aeroplane Construction

By OTTORINO POMILIO

THE fundamental criterion which ought to guide aeroplane designers is to obtain in all parts maximum strength with minimum amount of material and therefore minimum weight. Members exposed to the wind and therefore creating an air resistance, should be so designed as to reduce this resistance to a minimum. This is obtained by adopting sections which insure a *maximum air penetration.* For other members the more common I, U double T, box and circular sections, etc., may be adopted so as to increase the resisting moment as much as possible.

Among the other criterions to keep in mind, in designing the "ensemble" or any detail of an aeroplane we may note: *simplicity of construction and relative ease in repairing; ease in examining, repairing and dismounting the motor, homogeneousness of the whole; reduction of the various parts to the most simple expression possible; ease in the renewal of any part,* etc.

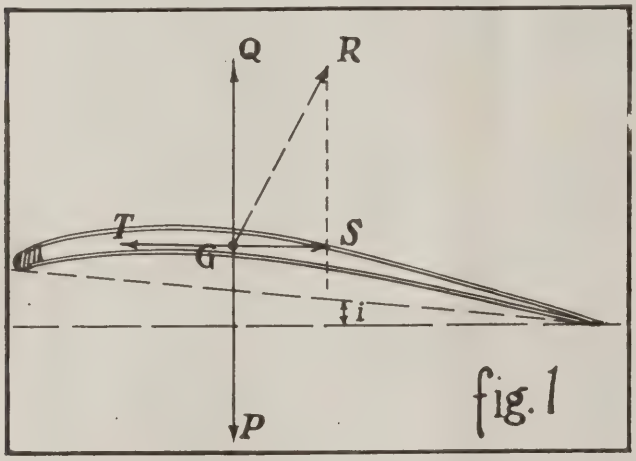


fig. 1

In other chapters describing the most important types of aeroplanes we will discuss many details of construction such as special piping, turnbuckle, bayonet-hilt connections, means devised to facilitate the taking down of the machine, landing chassis details, etc.

PART I

The Aeroplane as a Structure

INTRODUCTION

The aeroplane is a flying machine which sustains itself in the air by dynamical means based on the principle embodied in the action of an oblique force.

Diagrammatically the aeroplane may be represented by a framework covered with cloth or similar material and a propelling agent (fig. 1). This frame, moving with a given velocity, is subjected to an air reaction R, whose vertical component Q, which balances the weight P of the machine, is much greater in magnitude than the horizontal component S, which is balanced by the tractive force T developed by the propeller.

Practically in every aeroplane are found the following essential or principal parts:

1—The main framework, or wings which enable the machine to sustain itself.

2—The propelling motor group, which furnishes and transforms the energy necessary for propulsion.

3—The secondary frames used in stabilizing and in giving direction to the machine.

4—The landing gear or chassis, which permits the aeroplane to start or land on ground or water.

5—The fuselage serves to unite all the above mentioned parts into a practical and efficient machine.

CHAPTER I

The Lifting Surface or Wings

The principal frame (wings) of an aeroplane is often called the lifting surface. This in reality is a solid, in which one dimension, the thickness, has a degree of magnitude much smaller than that of either of the other two dimensions.

MONOPLANES AND BIPLANES: Before discussing in detail the shapes, sections and structure of the frame, we will

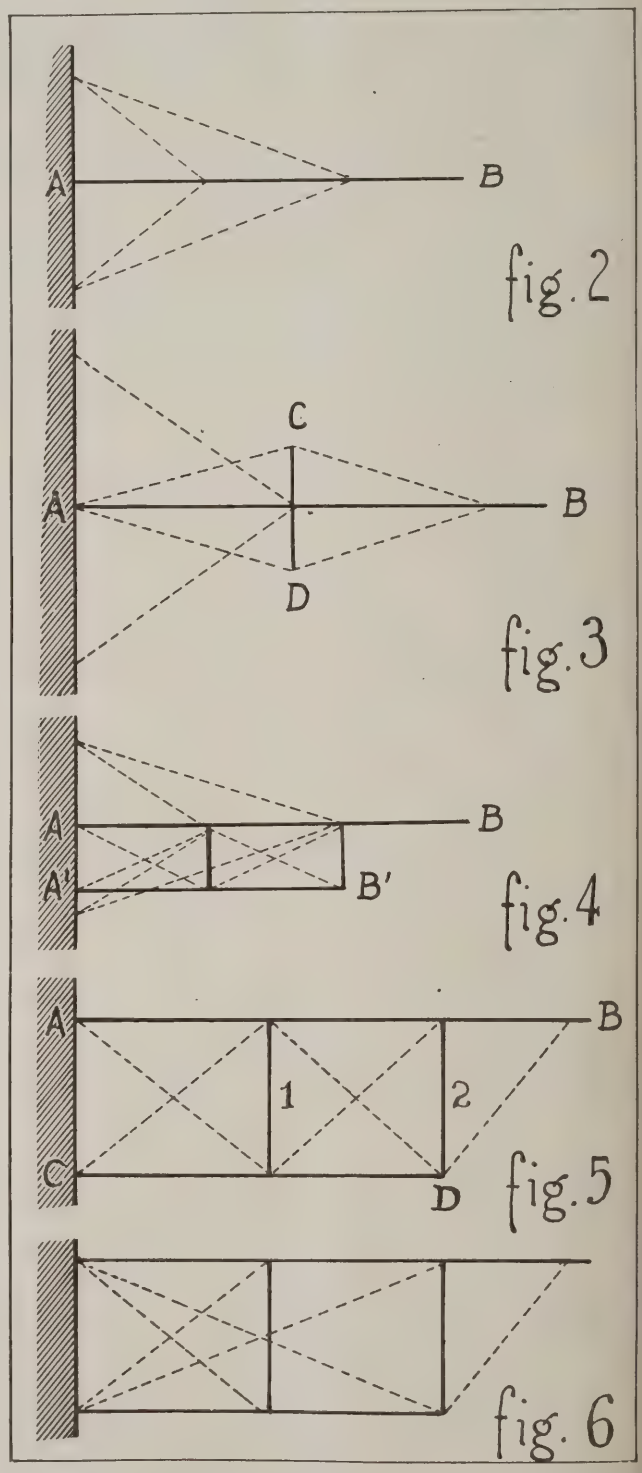


fig. 2
fig. 3
fig. 4
fig. 5
fig. 6

note at once that the arrangement of the wings in a machine will divide aeroplanes into two large classes: monoplanes and biplanes.

An aeroplane is a monoplane when the lifting surface is distributed all on the same plane.

Biplanes are those machines in which two planes, one above the other constitute the lifting surface.

We will compare these two types briefly, from a military aerodynamic and technical point of view.

As a foreword we will deal with military aviation problems only in so far as they present in themselves problems

of a technical nature, and will discuss them from the technical point of view only. One of the first requisites for a military machine is that it must present a vast field of vision to the pilot and to the observer. It is without doubt that from that point of view biplanes and especially those of the pusher type (i. e. with the propeller in the rear of the machine) present an enormous advantage when compared to the monoplanes.

(In fact while in biplanes the pilot and observer are seated in front of the wings which accordingly limits the field of vision in the rear of the machine only, in the monoplanes we find that the wings offer an opaque shield to the eye of the pilot. That inconvenience in spite of all the improvements so far introduced has been only partially eliminated. This is only one of the reasons why the biplane has met with such great favor in military circles, especially in England and Germany) at present also in Italy and France.

From the aerodynamic standpoint also it seemed until recently at the outbreak of the European War that the monoplane was vastly superior to the biplane. The first biplane,

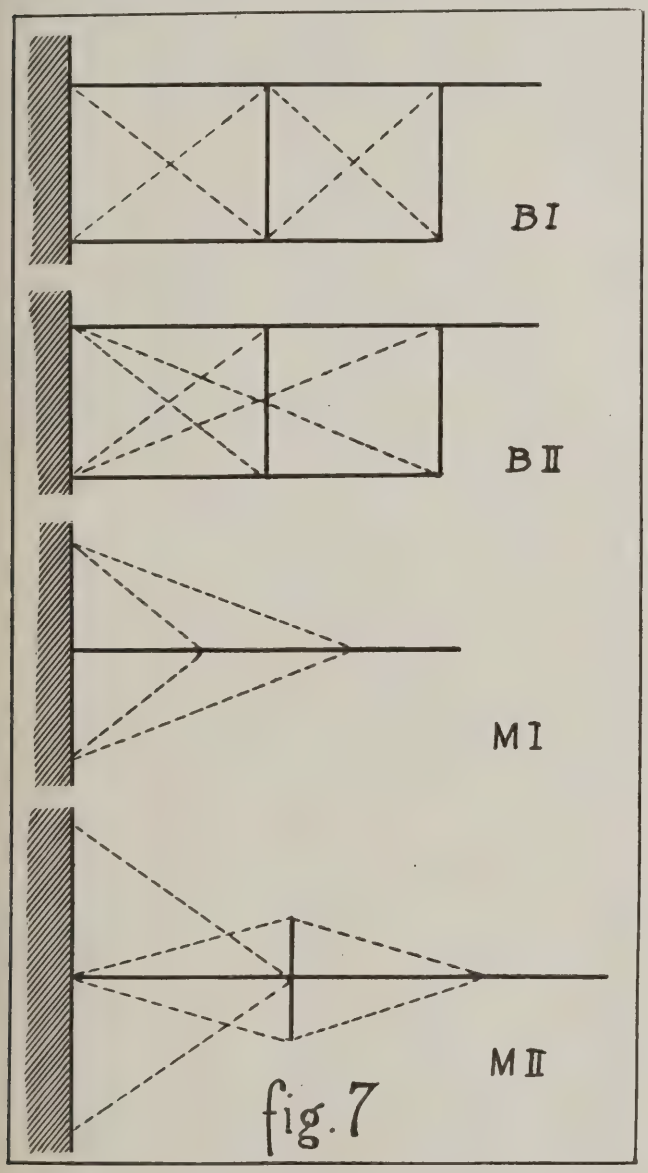


fig. 7

whose frames were held together by a thick network of steel wires and badly designed struts, whose clumsy landing chassis offered bad qualities of air penetration, and whose design as a whole was the result of makeshifts resorted to in the first days of that type, was without doubt a slow machine, of low efficiency and therefore lacking that exuberance of power which is inherent to that combination of flying qualities characteristic of a good aeroplane. On the other hand we have the monoplane. Being small and light and possessing great agility and air penetrating characteristics, and endowed with high climbing velocity, *i. e.*, great excess of power; with its triumphs in all of the most important air races, with its fantastic flights, even in the midst of storms, the monoplane seemed destined to take the place of the biplanes once and for all.

Instead, progress in aviation did not take that trend and things changed considerably. The laboratory and practical experience have shown that in a biplane the qualities of air penetration may be so improved as to become equal to if not superior to those of the monoplane.

We may say now that the average velocity of a biplane is equal to and what is better superior to that of a monoplane of the same power. Moreover, the biplane has the advantage of being able to *lift heavier loads,* this being due to its greater lift per sq. ft.; and that of *a much greater variation of velocity.* These characteristics are of capital importance in getting off ground or in landing. Therefore, from the aerodynamic standpoint the disadvantages of the biplane type have fast disappeared.

Technically speaking the biplane offers some advantage, especially as a large machine. The structure of a plane as we will see shortly, consists essentially of two or more beams called longerons running parallel to the length of the plane and held together by transverse ribs. The connection of the wings to the body of the aeroplane or the fuselage is made at the inner ends of the longerons which therefore are the members constituting the backbone of the resistance to the stresses to which the wings are subjected.

In the monoplane the longerons whose inner ends are fastened or hinged at the fuselage, are braced by a system of steel cables. The methods adopted for this arrangement are three as illustrated in *fig. 2, 3, 4.*

The scheme of bramies shown in *fig. 2* is that most commonly adopted on French monoplanes. The longerons A B, one end being fixed at the fuselage and the other free, is held in place by two or more upper wire cables "s" and by a similar arrangement "i" below the plane. *Fig. 3* shows the solution adopted for the Antoinette but which now has been abandoned.

The longeron A B carries the strut C D at the point C. This strut with the steel cables D A and D B reenforces the longeron itself and the upper and lower cable "s" and "i" fix the trussed longeron with respect to the body or fuselage. The arrangement shown in *fig. 4* is that used on all German monoplanes of the Etrich type. The winglongeron A B is reenforced in trussed beam fashion by the lowerlongeron A′ B′, struts and inclined members of steel cable. This trussed beam is usually fixed to the fuselage by upper and lower systems of steel cable.

In the biplane, the corresponding longeron of the upper and lower wings are held together by struts and inclined members of steel cable, so as to constitute a true girder of the trellis type. *Fig. 5, 6,* show the two solutions generally adopted. In *Fig. 5* we see diagramatically the arrangement used on French and German biplanes. The longerons A B and C D are held together by the intermediate struts 1 and 2, and the whole is stiffened by St. Andrew's crosses of steel wire or cable. *Fig. 6* shows the scheme adopted for a great majority of English biplanes. The longeron and strut arrangement is the same as in *fig. 5,* but instead of the St. Andrew's cross system of steel cable, we have an arrangement of steel wire or cable analoyous to that used in monoplanes.

Thus even with these preliminary comparisons we begin to see how the biplane system if studied well may offer *greater strength and rigidity than the monoplane system, weights being equal.* However, it might be of interest to interpolate here a few figures which will help us to compare the two types. These figures were worked out by the English aeroplane constructor Handley Page.

Handly-Page has taken for comparison the four types shown in *fig. 7 i.e.,* two biplanes (*B I, B II*) and two monoplanes (*MI, M II*). The computations have been made for three machines of each type. These three machines differ among themselves in size only. The lift per square foot of wing surface has been assumed constant for all the machines, and is equal to 4.9 lbs. per square foot.

The lifting surfaces and the total loads are the same for the same size machine of each of the IV types, so that we have

Size	Lifting Surface	Total Load
1	151 Sq. Ft.	738 lbs.
2	274 Sq. Ft.	1,340 lbs.
3	398 Sq. Ft.	1,950 lbs.

The principal dimensions are as follows:

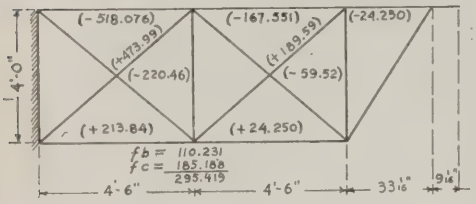
Size		Span Upper Plane	Span Lower Plane	Chord
1	Mon.	29′-10¾″	.....	4′-11¾″
	Bip.	24′-11⅝″	17′-11⅝″	3′- 5¾″
2	Mon.	40′-10¾″	.....	6′- 9 ″
	Bip.	33′- 9¼″	23′-11⅝″	4′- 8⅝″
3	Mon.	46′-10½″	.....	8′- 6⅜″
	Bip.	40′- 8⅝″	29′- 1¾″	5′- 8½″

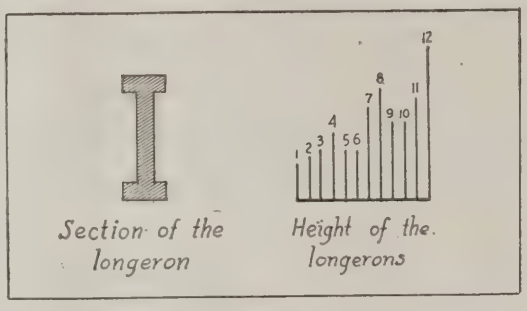
COMPARISON OF MONOPLANE AND BIPLANE WING STRUCTURES

FIGURE 8

1 W = Load per 3'-3 3/8" = 57.320 Lbs.

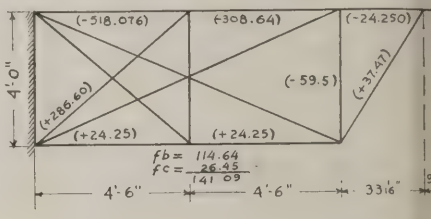
fb = 94.80 fc = 57.32 / 152.12 — fb = 55.11 fc = 17.63 / 72.74 — fb = 13.22 fc = 2.64 / 15.86





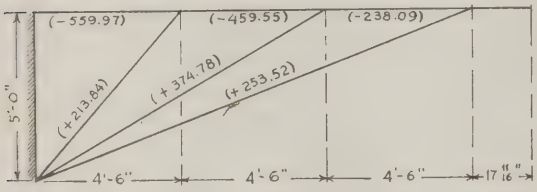
2 W = 57.320

fb = 94.80 fc = 57.32 / 152.12 — fb = 55.11 fc = 33.06 / 88.17 — fb = 11.0 fc = 2.6 / 13.6



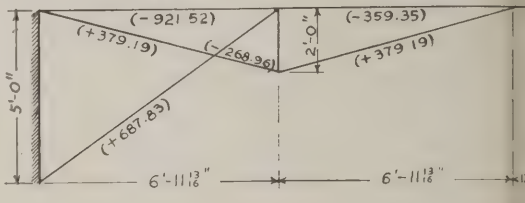
3 W = 79.36

fb = 90.38 fc = 55.11 / 145.49 — fb = 74.95 fc = 44.09 / 119.04 — fb = 46.29 fc = 24.25 / 70.54



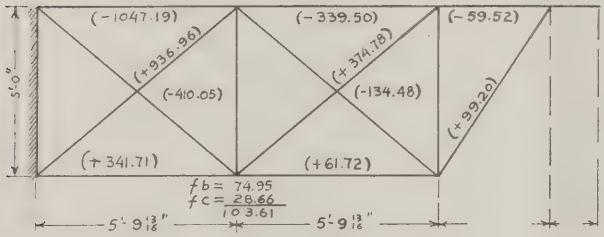
4 W = 79.36

fb = 79.36 fc = 158.72 — fb = 13.22 fc = 30.86 / 44.08



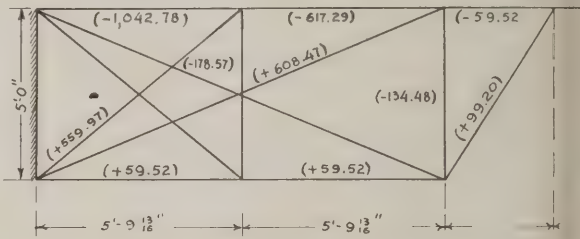
5 W = 77.162

fb = 68.34 fc = 79.36 / 147.70 — fb = 37.47 fc = 26.45 / 63.92 — fb = 8.81 fc = 4.40 / 13.21



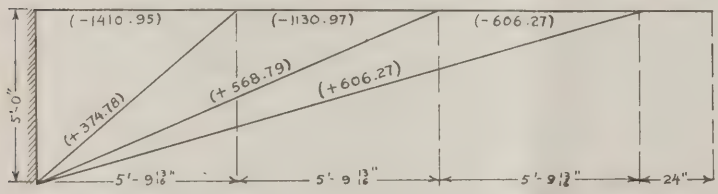
6 W = 77.162

fb = 68.34 fc = 79.36 / 147.70 — fb = 37.47 fc = 46.29 / 83.76 — fb = 8.81 fc = 4.40 / 13.21



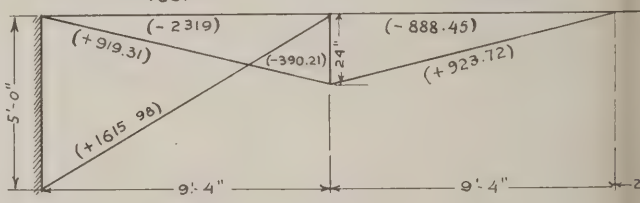
7 W = 110.23

fb = 72.75 fc = 94.79 / 167.54 — fb = 57.32 fc = 74.95 / 132.17 — fb = 35.27 fc = 39.68 / 74.95



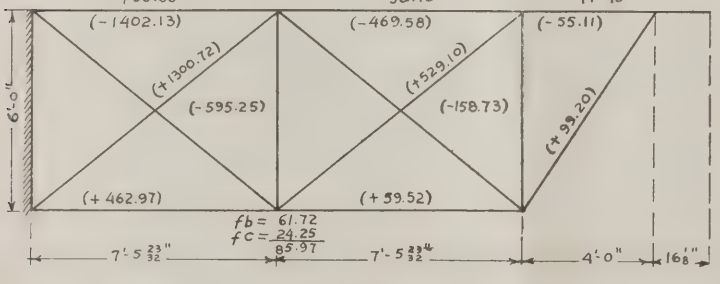
8 W = 110.23

fb = 59.52 fc = 103.61 / 163.13 — fb = 114.64 fc = 39.68 / 154.32



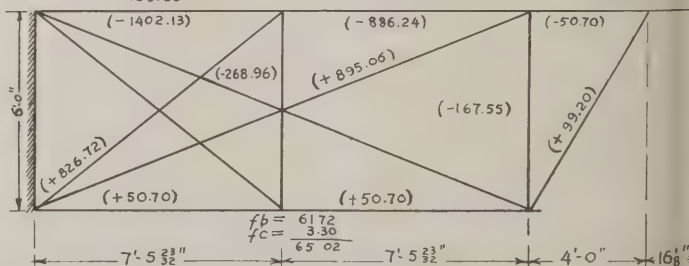
9 W = 92.59

fb = 55.11 fc = 83.77 / 138.88 — fb = 26.45 fc = 24.25 / 50.70 — fb = 8.37 fc = 3.08 / 11.45



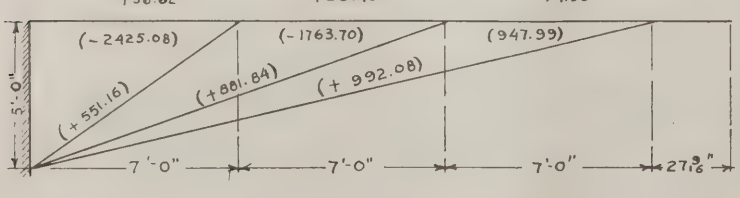
10 W = 92.59

fb = 55.11 fc = 83.77 / 138.88 — fb = 26.45 fc = 48.50 / 74.95 — fb = 8.37 fc = 3.08 / 11.45



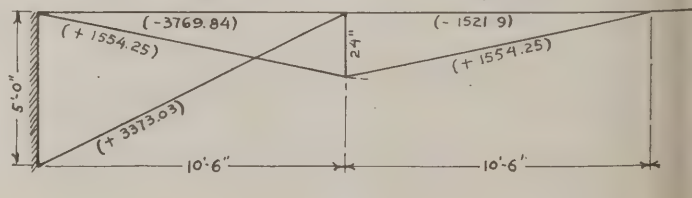
11 W = 136.68

fb = 52.91 fc = 103.61 / 156.52 — fb = 39.68 fc = 83.77 / 123.45 — fb = 30.86 fc = 44.09 / 74.95



12 W = 136.68

fb = 46.29 fc = 105.82 / 152.11 — fb = 11.02 fc = 4.40 / 15.42



The computations have been made with the assumption that each plane has only one longeron or spar but this, thus does not detract from the general character of the problem. Planes have been constructed with one longeron; the Breguet for instance. If there are two longerons, then we only have to decompose the forces acting on the wing along the two spars and the same line of reasoning will follow. Assuming then one longeron, the load per linear foot of longeron is equal to C x 4.9 lbs., where C is the plan chord in feet.

Since there are two types of monoplanes and two types of biplanes, we will have 12 diagrams in all (see *fig.* 8). In studying these diagrams we find that in each one we have

1. The load per linear ft. of longeron = W.
2. The tension and compression stresses in the longerons depending on the action of the wire bracing.
3. The tension stresses in the wire crossbracing.
4. The composite unit stress due to direct compression and flexure in the longeron. The algebraic sum $fc + fb$ of these two stresses gives the total intensity of stress in the longeron.

The comparison between the compression and tension stresses existing in any member of the machine may be made immediately. There is a difference however, for the combined stresses due to compression and flexure acting at the same time. These combined stresses are expressed by the equation

$$f = \frac{M}{I/V} + \frac{P}{A}$$

Where M = Bending moment
I/V = Section modulus of section A
A = Area of section
P = Total force of compression.

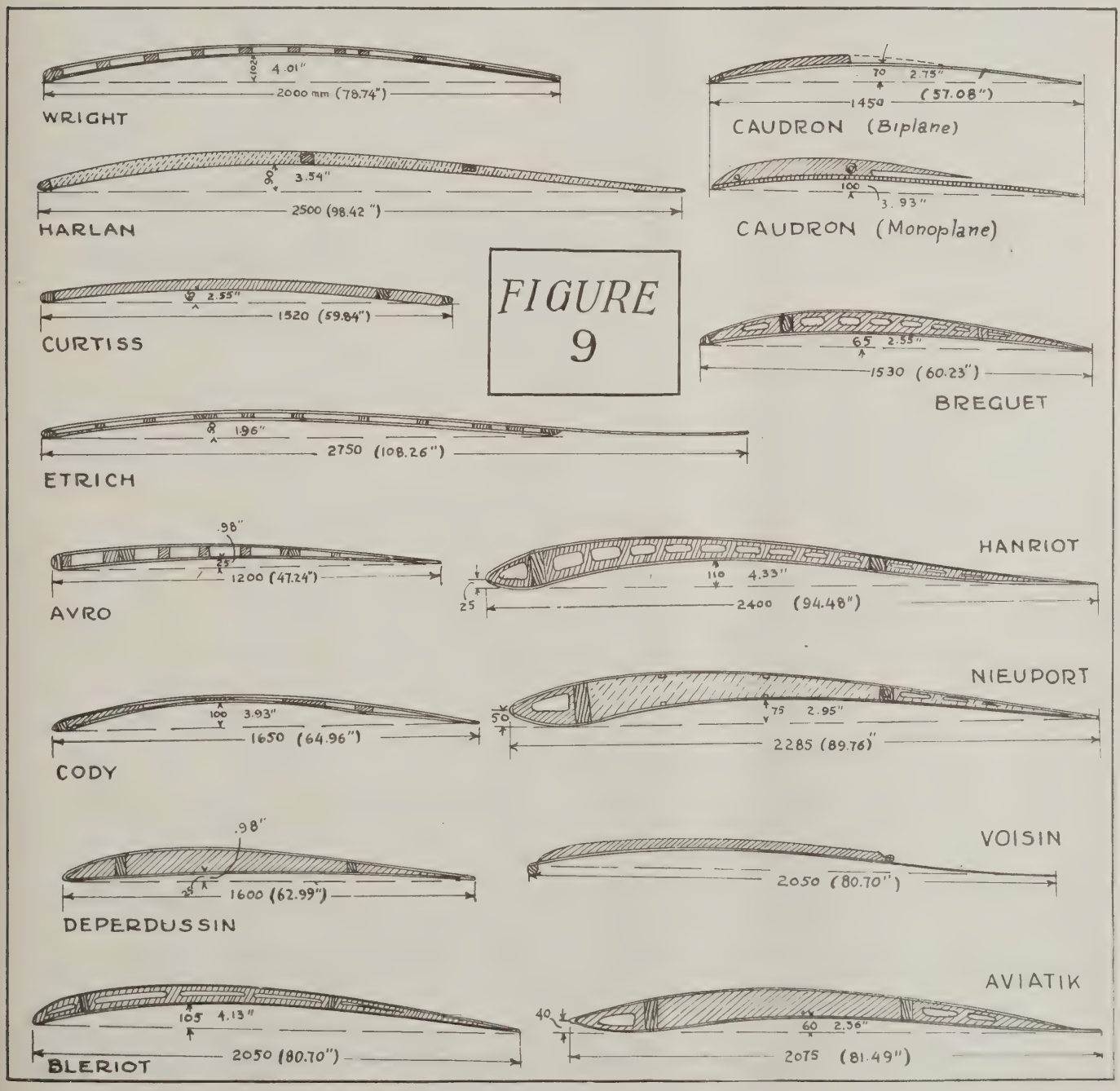
so that the section A of the longeron is a function of the combined stress. We may assume an I section for the longeron, of constant width but of a depth which will vary for the various cases, so that the depth of longeron required for each single case will give us an idea on the advantages and disadvantages of the various types.

We can readily see that the most important stresses are those found in the longerons. Therefore the limits for a given type of machine will be defined by the dimensions of the longerous rather than by those of the interplane struts. In *fig.* 9 are shown the depths of longeron computed for the various types.

A glance at the computations shows that the bending moment is the determining factor and not the compression stress. This is especially true for monoplanes of large wing spread. In this case the required depth of longeron increases rapidly.

For small machines, one type has no decided advantage over the other. For large machines the biplane type is much better to use than the monoplane type.

So far the discussion has been based on the structural and technical point of view only. Other characteristic such as military qualities, ease of taking machine down and ease of transportation, etc., have not been considered.



INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications, which supplement those published in AERIAL AGE for December 24.

Specifications for Cold-Rolled or Drawn Carbon Steel Bars

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

USE.—2. These bars are suitable only for low-stressed parts.

MATERIAL.—3. The material for these bars shall be chosen from the I. A. S. B. standard carbon steels listed below. The composition shall be stated by the manufacturer or contractor, and is further limited as follows: Carbon, not over 0.25 per cent.

MANUFACTURE.—4. The steel shall be manufactured, or at least finished, by the open-hearth, electric-furnace, or crucible process.

WORKMANSHIP AND FINISH.—5. (*a*) The bars are to be bright and clean, sound, straight, free from pipes, laps, cracks, twists, seams, and damaged ends, and are to have a workmanlike finish. They are to be uniform in quality, within the stipulated margins of manufacture capable of being turned and threaded readily, and of taking a good finish.

(*b*) Any bar may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—6. The bars shall have the following physical properties:

Tensile Test.—(*a*)

Bend Test.—(*b*)—Bend-test pieces from bars of 0.75 inch (19.05 mm.) or less diameter (or width across the flats) shall be tested in full size as rolled or drawn. Above 0.75 inch (19.05 mm.) diameter or width across the flats) the test pieces may be turned down from the bar to a diameter of 0.756 inch (19.08 mm.) The test pieces shall withstand bending cold through an angle of 180 degrees over a radius equal to their diameter (or width across flats) without fracture.

	Bars not over 0.75 inch (19.08 mm.) diameter or width across the flats.	Bars over 0.75 inch (19.08mm.) and not over 1.50 inches (38.10 mm.) diameter or width across the flats.	Bars over 1.50 inches (38.10 mm.) diameter or width across the flats.
Minimum tensile strength.....	70,000 lbs./in.²	70,000 lbs./in.²	65,000 lbs./in.²
Minimum yield point.....	50,000 lbs./in.²	50,000 lbs./in.²	50,000 lbs./in.²
Minimum elongation in 2 inches or proportion gauge length..	20 per cent.	17 per cent.	15 per cent.
Minimum reduction of area...	40 per cent.	38 per cent.	35 per cent.
Minimum tensile strength.....	49.2 kg./mm.²	49.2 kg./mm.²	45.6 kg./mm.²
Minimum yield point.....	35.1 kg./mm.²	35.1 kg./mm.²	35.1 kg./mm.²
Minimum elongation in 2 inches or proportion gauge length..	20 per cent.	17 per cent.	15 per cent.
Minimum reduction of area...	40 per cent.	38 per cent.	35 per cent.

SELECTION OF TEST SPECIMENS.—7. (*a*) The bars shall be grouped by heats or melts into lots conforming to the size limits given in paragraph 6. The inspector shall select at random 1 per cent but not less than three bars of each lot to be representative of the sizes in the lot. One tensile and one bend test specimen shall be cut from each bar.

(*b*) For sizes over 1.50 inches (3.86 cm.) in diameter or width across the flats, one tensile and one bend specimen shall be taken from a bar of each size represented in the lot.

(*c*) The bars and specimens shall be stamped for identification. Whenever bars can not be grouped by heats or melts, one tensile and one bend test specimen shall be taken from each lot of 100 bars or less. The provisions as to grouping by size limits and provisions for bars of over 1.50 inches (3.86 cm.) diameter, as given above, shall apply.

(*d*) The specimens shall not be annealed or otherwise treated before they are tested. They are to be tested in full section, unless the bars are to be subsequently reduced in section by machining. In this event, the tensile specimens may be machined to standard sizes in accordance with specification 1G1.

DIMENSIONS AND TOLERANCES.—8. The dimensions and tolerances shall be those given in the specification 3S11.

DELIVERY, PACKING, AND SHIPPING.—9. (*a*) All bars shall be suitably greased for protection against corrosion.

(*b*) The bars shall in general be grouped in bundles weighing not more than 220 pounds (100 kg.), unless otherwise agreed between manufacturer and purchaser; the heat number and the I. A. S. B. steel serial number shall be plainly marked on a metal tag attached to each bundle. If bars are not so grouped and bundled, each bar shall be plainly marked with the heat and the I. A. S. B. steel serial number.

Compositions of standard steels.

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1010.....	0.05–0.15	0.30–0.60	0.045	0.050
1015.....	.10– .20	.30– .60	.045	.050
1020.....	.15– .25	.30– .60	.045	.050

When electric or crucible furnace steel is specified in the order, the maximum allowable percentage of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

Specifications for Phosphor Bronze Castings for Bearings

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

USE.—2. This material is suitable for liners in babbitted bearings.

MATERIAL.—3. The chemical composition shall be as follows:

	Per cent.
Copper	79.00–81.00
Tin	9.00–11.00
Lead	9.00–11.00
Phosphorus	0.10– 0.30
Total impurities, maximum.	0.25

MANUFACTURE.—4. (*a*) The material shall be made from lake or electrolytic copper conforming to the I. A. S. B. specification 2N2 and from pig tin at least 99 per cent pure.

(*b*) No scrap shall be used other than that produced in the manufacturers' own plants and which is of the same composition as the material specified.

WORKMANSHIP AND FINISH.—5. Castings shall be homogeneous and free from shrinkage cracks, spongy spots, blowholes, and foreign matter. Castings in which defects are revealed by machining operations shall be replaced by the manufacturer. The full weight of the original material in rejected castings shall be returned to the manufacturer.

DIMENSIONS AND TOLERANCES.—6. Castings must be true to pattern; cores must be correctly placed. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving any trace of the original surface.

Specifications for Seamless Brass Tubes

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

USE.—2. This tubing is resistant to the corrosive action of salt water, salt air, and gases.

MATERIAL.—3. (*a*) The brass shall have the following composition:

	Per cent.
Copper	79.00 to 82.00
Lead, maximum.....	.20
Iron, maximum.....	.10
Zinc	Remainder.

(*b*) Samples for analysis may consist of turnings taken from the end of the tube or of drillings. Points from which drillings are taken must be distributed around the surface of the tube so as to yield a representative sample of the tube wall.

MANUFACTURE.—4. (*a*) The brass shall be made from lake or electrolytic copper conforming to the I. A. S. B. specification 2N2 and from B or C grade spelter conforming to I. A. S. B. specification 2N3.

(*b*) No scrap shall be used other than that produced in the manufacturers' own plants and of the same composition as the material specified.

(*c*) Tubing shall be semi-annealed unless otherwise specified.

(*d*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubing shall be clean, smooth and free from all injurious defects, both inside and outside.

PHYSICAL PROPERTIES AND TESTS.—6. (*a*) *Flattening Test.*—A piece of tube, 2 diameters in length, shall be flattened with a hammer until it passes freely through a micrometer caliper set at three times the thickness of the tube wall. The tube must stand this test without showing cracks or other defects.

(*b*) *Expanding Test.*—A pin with a taper of one in eight shall be driven into one end of the tube until the tube's diameter is increased by one-sixth. The tube must stand this test without showing cracks, splits, or other defects.

(*c*) *Hydrostatic Pressure Test.*—Each tube shall be subjected to a hydrostatic pressure which will develop a tensile stress of 7,000 pounds per square inch (4.92 kg./mm.²) in the tube, but in no case shall a test pressure of more than 1,000 pounds per square inch (0.703 kg./mm.²) be required. Each tube must withstand this test without cracks, flaws, leaks, or other defects such as bulging.[a]

[a] The pressure to be applied shall be calculated from the formula

$$P = \frac{7{,}000\ T}{R}$$

Where P = the hydrostatic pressure in pounds per square inch.
T = the thickness of the tube wall in inches.
R = the internal radius of the tube.

SELECTION OF TEST SPECIMENS.—7. (*a*) Each tube shall be subjected to a hydrostatic test. One tube from each lot of 100 or less shall be subjected to a flattening and to an expanding test.

(*b*) If any tube fails to pass the flattening or the expanding test, two more tubes representing the same lot shall be subjected to both tests. If either of these tubes fail in either test the lot which they represent shall be rejected.

(*c*) Any tube failing to meet the hydrostatic test shall be rejected.

DIMENSIONS AND TOLERANCES.—8. (*a*) TOLERANCES.—The following tolerances shall be allowed on wall thickness and outside diameter:

Tolerances for outside diameter and wall thickness

Outside diameter.	Tolerances on outside diameter.	Wall thickness.	Wall-thickness tolerance.
Inches.	*Inch.*	*Inch.*	*Inch.*
0–0.50	±0.002	0–0.0156	±0.001
0.51– .75	± .0025	0.0157– .0312	± .002
.76–1.00	± .003	.0313– .0625	± .003
1.01–1.25	± .0035	.0626– .1250	± .005
1.26–1.50	± .004	.1251– .2500	± .008
1.51–1.75	± .0045	.2501– .3125	± .0125
1.76–2.00	± .005	.3126– .3750	± .0150
2.01	±(.25%)		
Millimeters.	*Millimeter.*	*Millimeters.*	*Millimeter.*
0–12.70	±0.05	0–0.397	±0.03
12.70 –19.05	± .06	0.40 – .79	± .05
19.06 –25.40	± .08	0.791 –1.59	± .08
25.41 –31.80	± .09	1.591 –3.17	± .13
31.81 –38.10	± .10	3.171 –6.35	± .20
38.11 –44.45	± .11	6.351 –7.94	± .32
44.46 –50.80	± .13	7.941 –9.53	± .38
50.81	±(.25%)		

MEASURING DISTANCES BY MEANS OF PRISMATIC BINOCULARS*



Fig. 1.

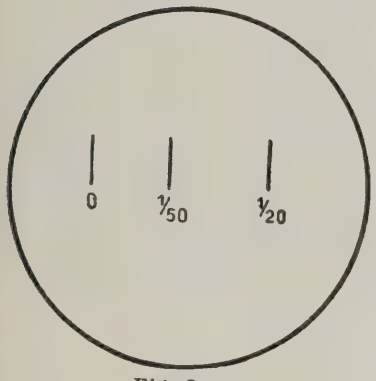


Fig. 2.



Fig. 3.

THERE are already in existence numerous ingenious instruments for measuring distances. Frequently, however, it is desirable to estimate a certain distance with a fair amount of accuracy, and by the simplest means possible. This is not always an easy matter, especially in unfamiliar surroundings, and only after long practice will such estimates turn out comparatively accurate. An instrument which is of great assistance in judging distances is the prismatic form of binoculars when provided with a calibrated disc.

These discs enhance the already many-sided utility of the prismatic binoculars, and offer the further advantage that they do not in the slightest interfere with the view when the binoculars are used for the purpose for which they were originally designed. The calibrated disc, which consists of a thin glass plate with the divisional lines marked on it, is placed in the right-hand barrel. By means of the disc the distance to an object of known dimensions can be ascertained, or, conversely, if the distance be known the dimensions of the object can be found. Discs are now manufactured which are calibrated according to the purpose for which they are intended. Thus Fig. 1 shows a disc for use by infantry, Fig. 2 one for pioneers, and Fig. 3 a disc for use by artillery.

Suppose it is desired to find the distance from the observer to the airship "Schwaben," shown in Fig. 4. On the calibrated disc it is seen that the airship covers a length of 65/1000. (Lines 20 to 85.) As it is known that the length of the "Schwaben" is 146 meters, its distance from the observer is $\frac{146 \times 1{,}000}{65} =$ 2,246.15 metres. In Fig. 5 the distance to the house is 550 metres. The house is shown on the disc to be 20/1,000 high. Its height is therefore $\frac{20 \times 550}{1{,}000} = 11$ metres.

In Fig. 6 the width of the house is known to be 30 metres. On the disc the house is seen to be 65/1,000 wide. The distance to the house is therefore $\frac{30 \times 1{,}000}{65} = 461.5$ metres.

* *"Motor,"* Berlin.



Fig. 4.



Fig. 5.



Fig. 6.

(*b*) *Length.*—When no length is specified, tubes may be shipped in stock lengths of 10 feet (3.04 m.) to 14 feet (4.27 m.). When ordered in definite lengths no length shall be less than that specified.

Specifications for Babbitt Metal for Bronze-Backed Bearings

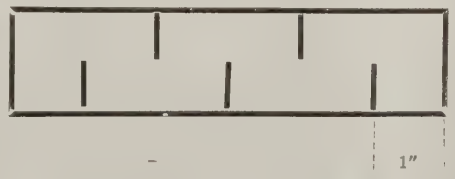
GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The composition of the material shall be as follows:

Constituent.	Desired. *Per cent.*	Allowable variation. *Per cent.*
Tin	91.00	90–92
Antimony	4.50	4–5
Copper	4.50	4–5
Lead, maximum	.20	.....

SAMPLE FOR ANALYSIS.—3. (*a*) The inspector shall select one ingot from each lot of 25. The manufacturer shall melt this ingot in a clean ladle and cast therefrom one or more sample bars 6 inches long, 1 inch wide, and not more than ¼ inch thick.

(*b*) Saw cuts shall be made in each sample bar, as shown in the diagram below. The cuttings shall be thoroughly mixed and must be free from iron and dust. Samples for analysis shall be taken from the mixed cuttings.



MANUFACTURE.—4. (*a*) The babbitt metal shall be made from lake or electrolytic copper conforming to the I. A. S. B. specification 2N2 and from the best commercial grades of tin and antimony.

(*b*) No scrap shall be used other than that produced in the manufacturers' own plants and which is of the same composition as the material specified.

Specifications for Soft Solder

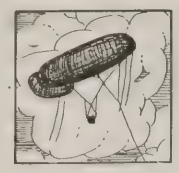
GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2 Solder shall be made from new tin and commercially pure new lead. Its composition shall be as follows:

	Per cent.
Lead and tin, minimum	99.8
Tin	49 to 51
Antimony, maximum	10
Zinc	None.

DELIVERY, SHIPPING, AND PACKING.—3. Solder shall be delivered in 1-pound bars. The mark "Half and half" shall be cast on each bar. The bars shall be packed in boxes, the gross weight of which shall not exceed 220 pounds (100 kg.).

REFERENCES.—4. United States Navy Department. Specification No. 47S7.



MILITARY AEROSTATICS



Instructions for Officers and Enlisted Men Detailed From the Navy to Aviation

The following instructions (replacing those of May 1, 1917) are issued in regard to officers and enlisted men detailed from the Navy for Aviation.

1. Seaplane and Dirigible Duty.

(a) The total course of instruction for naval aviators will be approximately 6 months.

(b) An officer to be eligible for aviation detail must have served at least two years in a cruising ship, must volunteer to continue in aviation for the full term of detail, and must pass the physical examinations prescribed by the Bureau of Medicine and Surgery. The senior officer present will have the applicant examined physically before the request for such detail is forwarded.

(c) Officers and men of the Navy detailed for pilot duty will be classed as follows:

Student naval aviator (seaplane).
Student naval aviator (dirigible).
Naval aviator (seaplane).
Naval aviator (dirigible).

(d) The course of instruction for Quartermasters (aviation), Quartermasters (dirigible) and for Machinist's mates (aviation), will be approximately 3 months. The course of instruction for Carpenter's Mates (aviation), will be approximately 2 months. Personnel graduating from these instruction courses will be advanced in rating in accordance with their proficiency. Any man detailed from the regular service showing inaptitude during the training course or failing to quality after three months' instruction shall be returned to the ship or station from which received, or, if this is impracticable, to the nearest receiving ship for general detail.

(e) A special class of enlisted men will be detailed by the Commander-in-Chief of the Atlantic Fleet every three months, beginning January 1, 1918, for instruction for Quartermasters (A), Quartermasters (D), Carpenter's Mates (A), or Machinist's Mates (A), in addition to such other men as may be recruited for or assigned to such instruction. Applications from candidates in other fleets or shore stations should be sent to the Bureau in ample time to be acted upon before the next class convenes.

(f) Each such class of enlisted men will be composed of as nearly as possible the following ratings:

Four Chief Petty Officers, seaman branch.
Four Chief Petty Officers, machinist's mates.
Four Petty Officers, first or second class, electricians general or gunner's mates.
Four Petty Officers, first or second class, carpenter's mates.
Four Petty Officers, first or second class, machinist's mates.

(g) Enlisted men of the Navy to be eligible for these classes must have served one or more enlistments, must have at least two years to serve on present enlistment, must be not over 35 years of age, and must have service records of "good" or "excellent" in "proficiency in rating," "sobriety" and "obedience."

(h) Enlisted men of the Navy for duty as aviation mechanics will be distributed among the following ratings:



Demonstrating the excellent range of vision of the latest French Coast Patrol Dirigible. (French official photo.)

(1) Chief Quartermasters, (A).
Quartermasters, first class, (A).
Quartermasters, second class, (A).
Landsman for Quartermaster, (A).

These men, except landsman, will be skilled seaplane structure men, rated in accordance with their skill. They will have proficiency in seaplane rigging, fabric, wing structure, and pontoon repairs, and general structure upkeep. For enlistment as Landsman for Quartermaster (A), the requirements are: American citizenship, excellent intelligence and reputable character. Although no previous trade experience is required, a general manual ability is desirable. Special consideration will be given to men of trades such as rigger, fabric-worker or wire-worker.

(2) Chief Quartermasters, (D).
Quartermasters, first class, (D).
Quartermasters, second class, (D).
Landsman for Quartermaster, (D).

These men, except landsman, will be skilled in operation of hydrogen plants and in care and upkeep of dirigibles, and rated in accordance with their skill. For enlistment as Landsman for Quartermaster (D), the requirements are: American citizenship, excellent intelligence and reputable character. Although no previous trade experience is required, a general manual ability is desirable. Special consideration will be given to men of trades such as rigger or fabric-worker.

(3) Chief Carpenter's Mate, (A).
Carpenter's Mate, first class, (A).
Carpenter's Mate, second class, (A).
Landsman for Carpenter's Mate, (A).

These men, except landsman will be skilled in aviation wood working, and rated in accordance with their skill. For enlistment as Landsman for Carpenter's Mate (A), the requirements are: American citizenship, skilled trade proficiency in carpentry, and reputable character.

(4) Chief Machinist's Mate, (A).
Machinist's Mates, 1st class, (A).
Machinist's Mates, 2nd class, (A).
Landsman for Machinist's Mate, (A).

These men, except landsman, will be skilled aviation engine-men, rated in accordance with their skill. For enlistment as Landsman for Machinist's Mate (A), the requirements are: American citizenship, previous experience with aeronautic motors, or in allied skilled trades (such as machinist, electrician, garage mechanician), engine shop experience in general and reputable character.

2. Kite Balloon Duty.

(a) Details of officers and enlisted men for kite balloon duty will be made from time to time as required.

(b) The course of instruction will not exceed three months.

(c) Officers and enlisted men detailed for kite balloon pilot duty unless qualified as naval aviators (seaplane or dirigible) will be classed as student naval aviators (dirigible). Officers and enlisted men when qualified as kite balloon pilots will be designated as such.

3. Enlisted personnel qualified as naval aviators will be eligible for promotion to Boatswain, (Aviation).

4. Enlisted personnel qualified as aviation mechanics will be eligible for promotion to Machinists, (Aviation).

5. Such promotion will be subject to such general regulations as may from time to time be prescribed by the Department for promotion to warrant rank.

6. Aviation personnel of enlisted ratings who have the necesary qualifications will be eligible for commission in the Naval Reserve Flying Corps. Such candidates should make written application for commission in the Naval Reserve Flying Corps. If these applications are satisfactory, the Bureau will then consider the discharge of these candidates in order that they may enroll in the Reserve.

L. C. PALMER,
Chief of Bureau of Navigation.



The latest French Coast Patrol Dirigible. (French official photo.)

FOREIGN NEWS

FRANCE

An official announcement issued December 24th reports 100 aerial engagements on the western front, resulting in the loss of 18 German machines. The report reads as follows:

"On December 21, 22 and 23, our pursuit aviators were very active. Our pilots engaged in 100 combats, most of them over the German lines. Eighteen German machines were brought down. Of these, seventeen fell in flames or crashed to the ground and were destroyed. During this period our bombarding squadrons dropped 18,000 kilograms (nearly twenty tons) of projectiles on railway stations, factories, encampments and other objectives behind the enemy's lines."

A later announcement reports the defeat of another German machine, and another raid on Dunkirk:

"A German machine was brought down in an aerial combat on December 24 and another was forced to descend within the French lines in the evening of the 24th by the fire of our anti-aircraft guns. Dunkirk and its vicinity were bombarded by enemy aviators, causing several casualities."

More bombing activity is indicated in the official report issued on December 27, as follows:

"A German aeroplane was brought down in an aerial engagement on Monday. French bombarding aviators threw down 6,000 kilograms (11,000 pounds) of projectiles on railway stations and enemy quarters in the region of Rethel and Vouziers."

According to an Associated Press cable of December 27, the town of Rousselaere (Roulers), in Belgium, was almost laid waste recently by the terrific explosion of an ammunition train caused by bombs dropped by a British airman, according to the frontier correspondent of the Telegraaf. The aeroplane itself was brought down by the aerial pressure. Many Germans and a few Belgians, the latter engaged in forced labor, were killed.

In a despatch to the Daily Chronicle, a special correspondent states that in a recent list of French aces, there are 48 French names of which 37 are alive and 11 dead or disappeared, as against 57 Germans, of whom, however, 29 are among the lost, so that the French have a considerable superiority in surviving champions.

First Lieut. James D. Paull, Aviation Section, S. R. C., died as the result on an aeroplane accident. Lieut. Paull was a resident of Pittsburgh.

The Associated Press reports the establishment of a large school for aeroplane mechanics in France. It is said that thousands of men are learning to assemble, repair and care for aircraft.

A corporal of American engineers was killed and one private was wounded on Christmas Eve when a German shell dropped near a party of American engineers working in trenches on a section of the French front.

During a recent moonlight night German aviators dropped bombs near a certain town, and two American privates, who were in a camp in a wood, were killed. The German airmen flew low and dropped their bombs accurately.

American aviators in France entertained the children in the villages near which they were stationed on Christmas Day. When the youngsters had gathered at the hangars, an American corporal dressed as Stana Claus got into a big machine near-by and flew off. Fifteen minutes later he landed in the snow covered field near the hangar at which the children had gathered. The children had been told that Santa had abandoned his old sleigh for an aeroplane, but they did not believe it until the fact had actually been proven to them. Gifts were distributed to all the children.

GREAT BRITAIN

An official announcement issued on December 24, reports the use of aeroplanes in attacks on enemy infantry:

"A heavy fire from the air was poured on the enemy infantry on Saturday. In air fighting four hostile machines were brought down. After dark our aeroplanes bombed the airdromes of the enemy's night-flying squadrons and important railway stations. Many hits were obtained. All our machines returned safely."

A British Air Squadron conducted a very successful raid on Mannheim, one of the industrial cities on the Rhine. A ton of bombs were dropped and several fires were started. All but one of the British machines returned safely.

The statement issued on December 25, which describes the raid is as follows:

"The enemy's machines were very active on Sunday, and five of them were brought down in air fighting, three of them falling in our lines. Two other hostile machines were brought down in our lines by anti-aircraft gun-fire. One of the latter was a large twin engined machine with three occupants, who were made prisoners.

"Our night flying machines bombed several of the enemy's airdromes with good effect.

"At daylight on Monday, one of our squadrons bombed Mannheim on the Rhine with excellent results. A ton of bombs was dropped and bursts were observed in the large main station in the works and also in the town where fires were started.

"Very heavy anti-aircraft gun-fire was directed against our aeroplanes when they were over their objective, and one of our machines was damaged and forced to land. Several of the enemy's scouts made repeated attacks upon our formations, but were driven off. All of our machines returned except the one aforementioned."

A dispatch from Basel reports that the German Emperor and his staff in their return from a visit to the Verdun front had left Mannheim only an hour before the British aeroplanes destroyed the railway station. A section of the tracks was also torn up, which cut off communication to the North. The Emperor's train was the last to leave the town. The Swiss report further states that the Grand Ducal Palace and the bridge over the Neckar were damaged and that an ammunition factory in a northern suburb was blown up.

During the recent strike of mechanics in the aeroplane factories at Conventry, a fleet of army aeroplanes flew from their aerodrome on the west coast of England, and dropped leaflets over the town, urging the workers to return to work. A chaplain from the Naval Air Service was brought to the town in a seaplane and delivered an appeal from the members of the squadron to which he was attached, urging the striking workers to return to work, and pointing out the danger resulting from reduced production on England's air supremacy. The strike was settled the day following.

An Associated Press Dispatch reports the establishment of extensive training quarters for aeroplane mechanics in England and France. A call for 1,300 bricklayers and carpenters and also a large number of laborers for construction work has been received in Washington. When the work is finished in England, the men will be sent to France.

The number of men under training is not reported, but it is said that there will be a sufficient number ready to meet all the needs of the Air Service which we are establishing.

It is reported that the Ministry of Munitions intends to establish a great national aeroplane factory. It is argued that Great Britain should not be left to the mercy of individual manufacturers, and that since there are successful national shipyards, there is no reason why there should not be a national aeroplane factory.

INDIA

"Aeronautics" reports a new use for aeroplanes in India, which is of great assistance to the local authorities.

"Have found in the aeroplane an effective cure for the perennial uprisings of border tribesmen. A campaign against the Mahsuds, an unruly tribe inhabiting the "no man's land" between the frontier of India and the terriory of the Amir of Afghanistan, was brought to a successful conclusion in a few weeks, early in 1917, with the aid of aeroplanes, which promptly discovered the most secret assemblages of the tribesmen and reported them to headquarters. "The collection and advance of large bodies were watched and followed, and when the moment for attack arrived the tribesmen's formations were broken up or destroyed by low-flying aeroplanes dropping explosive bombs and scattering them, or leaving them exposed to attack by the advancing British line." The aeroplane has revolutionized the conditions of border warfare.

ITALY

The first official statement issued on the British sector of the Italian front reports aerial activity:

"Since a portion of the Italian front was taken over by British troops there has been no change in the situation on the British front. There has been active counter battery work and our airmen have given a good account of themselves, but have been hampered by unfavorable weather during the last few days.

"Some snow has fallen and the cold is severe, especially in the mountains. The health and spirits of the troops are excellent."

An Italian official announcement describes another huge bombing raid which gave very satisfactory results:

"A powerful squadron of Caproni aeroplanes was sent against large hostile forces in the Ronohi Valley and bombarded them, with very satisfactory results."

Italian and British aviators repulsed a heavy Austrian aeroplane attack at Treviso, which is sixteen miles north of Venice. An official announcement was issued on December 27 describing the victory as follows:

"A big aerial battle, in which British and Italian chasing squadrons and anti-aircraft artillery participated, was fought yesterday over Treviso. In the morning twenty-five enemy machines, under cover of the haze, arrived over our aviation camp to the west of the city and began to bombard it. The hostile aircraft were received with a violent anti-aircraft fire and, attacked impetuously by aeroplanes which ascended from the camp, were forced to retire before having carried out the operation. Eight of the enemy machines were brought down.

"Later another hostile squadron of eight machines made an attempt again, but was faced over Monte Belluno and forced to retire, losing three machines.

"Of the eleven enemy aeroplanes brought down eight fell inside our lines and three within the enemy lines. All our machines returned to their base. The damage caused by the bombardment was insignificant."

Later reports of the attempt of Austrian aviators to raid Treviso, which resulted so disastrously for them, emphasize the brilliant work done both by Italian and British aviators. Although eleven Austrian machines were brought down, only a few Italian aeroplanes were damaged. Five Italian soldiers and one British soldier were killed. Six Italian and eight British soldiers were wounded.

The British airmen brought down two machines and British anti-aircraft guns accounted for three more, six Austrians in these five machines being killed and four wounded. Among the prisoners is a young Austrian major, who is unwounded.

It is announced that Italy intends to train some of her air fighters in the United States. The reason given for this action is that better atmospheric conditions for training are to be found in the United States, and a saving in tonnage will be affected by making the shipment of training machines for such men as receive their instruction on this side of the water unnecessary.

Italian aviators have been distributing news to German and Austrian troops. It was found that the troops on the Italian front did not know of the recent British and French victories in Palestine and France and the Italians thoughtfully supplied them with pamphlets giving full details.

The first foreign troops to war, the royal eagle of the Italian Flying Corps are American airmen. Their smart aviation uniforms were greeted with cheers on the streets of Rome and Milan.

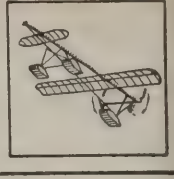
A dispatch from Rome dated December 28 announces the arrival of the American aviators:

"Some hundreds of American aviators, assigned to a school in a Southern Italian town, constitute the first American corps to reach Italy.



MODEL NEWS

Edited by G. A. Cavanagh



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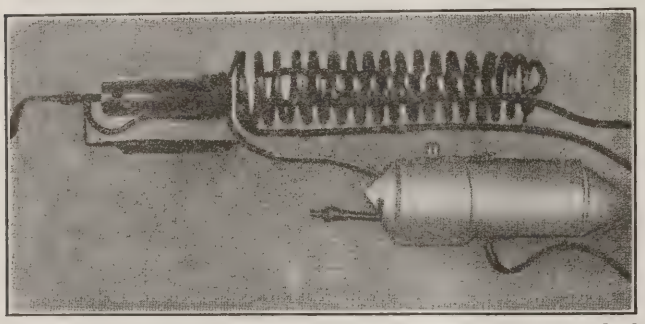
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

A Steam Power Plant for Model Aeroplanes

By L. F. Carter

THE development of a suitable power plant for model aeroplanes has long been the ambition of a great many model enthusiasts. To the advanced model maker, there is not, in the opinion of the writer, a more interesting and fascinating branch than that of model aeroplaning.

The use of steam as a motive for aeroplanes is, as we all know, a very old idea, having been first attempted by Stringfellow in 1846 in England, by Langley in 1896 in America, and of late years, by Messrs. W. O. Manning, H. H. Groves, and V. E. Johnson in England. The experiments of these last three gentlemen, as recorded in the *Model Engineer and Electrician*, have been a great incentive and also exceedingly



Section of the model aeroplane power plant operated by flash steam produced by the generator shown. As water is pumped through the coil of tubing, it is instantly converted into steam which operates the revolving cylinder engine. The tank carries water in one end and gasoline in the other.

helpful and instructive to the writer in the development of the flash steam plant about to be described.

Fig. 1 shows the general arrangement of the engine, boiler, fuel container and burner.

The engine is of the single acting rotary type, having three cylinders—the bore 5/8 in. and the stroke 3/4 in. The cylinders are of Tobin bronze, bored out quite thin, and supported radially from the valve by hollow columns on one side, and by the propeller bracket on the other. Needless to say, the valve is of the rotary type which admits steam to each cylinder successively as the pipes, or supporting columns, pass over the inlet port. As shown in Figs. 3, 4 and 5, steam is admitted during 50 per cent of the stroke, or while the engine revolves 90 degrees; then the cut-off takes place and the engine works on the expansion of the steam during the next 90 degree turn. The exhaust port is then uncovered during practically the entire return stroke of the piston.

The valve also forms the main and only bearing on which the engine revolves, and is made in a taper form so that any leakage or wear may readily be taken up. The crank is screwed and locked on the end of the valve. This allows the former to be set for either direction of rotation, and for the timing of the steam inlet and cut-off.

All joints and pipe connections are silver soldered, as soft solder would soon melt out under the high temperature at which the engine operates. The propeller mounting consists simply of a star-shaped piece of 3/64 in. steel brazed to the cylinders, and the propeller is held to this by means of a screw and nut. Three driving pins are set in the plate which assure a positive drive to the propeller.

The advantages of this type of engine are many, particularly in weight, continuous torque, freedom from vibration, and simple construction. Experiments with this engine when driving an 18 inch—28 inch pitch propeller directly connected, frequently showed a thrust of 24 ounces, which is slightly in excess of the total weight of the entire plant, including fuel enough for a seven minute run.

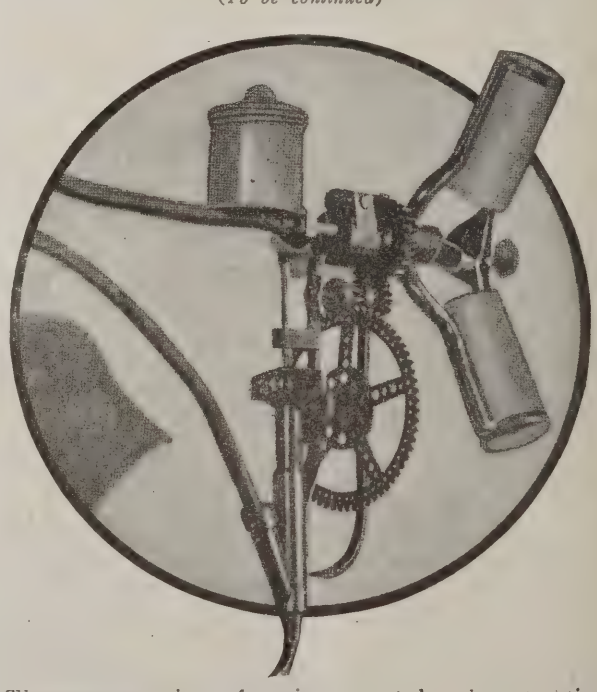
The weight of the engine alone 3¼ ounces. This light weight for an engine capable of developing a quarter horse power can be obtained only in one of the radial cylinder types, because of the absence of a long multi throw crank shaft with its correspondingly extensive crank case and bearings.

The flesh boiler was made from 8 ft. of 1/8 in. inside diameter copper tubing wound up on a taper mandrel. The overall length is 7½ in., being 1⅞ in. in diameter at the burner end, and 1⅜ in. at the tail end. The super-heater consists of two loops of the same material placed in the center of the coils, one end of which is brazed to the latter, and the other end fitted with a screwed connection for the purpose of connecting it to the hollow crank shaft of the engine.

Water is supplied to the boiler at the big end of the coils from a force feed pump which is driven by the engine through a train of gears, giving a reduction of 5 to 1, as shown in Fig. 2. The gasoline container is then filled half full and then given one or two strokes of a hand pump through the check valve which projects from the front of the container.

The needle valve at the burner is then opened long enough to allow the gasoline to drip from the spray nozzle and thence to the priming tray. Half a teaspoonful is sufficient to heat the burner. When this is almost completely burned out, the needle valve may be opened and the burner will start off with a terrific roar. It is then necessary to start the water into the coils before they become overheated. By turning the propeller over several times, the pump is set in operation and the water is forced into the hot coil. Considering that the coils work at a red hot temperature, the valve of the steam pressure often runs up to between 200 and 300 pounds per square inch.

(To be continued)



Three-quarter view of engine mounted, valve operating gears, etc.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Christmas Gift From Fritz

"WHAT a life! What a ——— life!" said the second in command, wiping the dust and perspiration from his face. "And tomorrow's Christmas day. Damned funny idea, too, celebrating Christmas in a hole like this—nothing to eat but goat and nothing to wash it down with but *brakwasser*. Reminds me of ——— no, it doesn't remind me of anything except the things I don't want to remember just now."

Nobody had any comment to offer, since everyone was thinking the same thing. It is difficult to be one's bright and cheery self on Christmas Eve in the middle of the South-West African desert with a sandstorm raging outside and the temperature of the mess-tent at 105. Add to this that you've spent weeks in trying to come to grips with an elusive enemy who declines to fight, marching and retiring again, day in and day out, until you've become sun-dried by the climate and fed up with the apparently utter aimlessness of the job. Also that commons are short, and that you haven't had a drink of anything stronger than tea for weeks, and that every time you go out on the strafe you find that Fritz has marked his camping places with dozens upon dozens of empty beer bottles and never by any chance a full one. It wouldn't be so bad if you could only get at him to get a bit of your own back. But all you ever see of Fritz in the flesh is his airman, who comes over with the regularity of quarter day and strafes you with all kinds of unpleasantness to which you can't make any reply worth writing home about.

"Hullo, here's the C.O. Any news, Sir?"

"Yes. I've just been down to railhead, and there's a couple of cases of stuff there for us that'll make a change. Comforts of sorts they are—and a case of whisky. You might send down for them. And, by the way, the General wants us to detail a couple of machine-gun crews to have a go at Fritz if he comes over in the morning. There's no news of guns coming up, and the old man's a bit fed up."

An hour later and the whole complexion of things has changed. For the first time for weeks we are sitting down each with a real whisky with real soda in it and a prospect of something like a real dinner tomorrow. Everybody is merry and bright and feeling quite Christmassy.

"Hope old Fritz will drop along tomorrow," said one of the juniors, he who has been told off to take charge of the maxims for Fritz's especial benefit.

"I don't know, Tommy," said another. "Fritz is rather a good sportsman, and you're a bit of a nut with the guns. I'd like to see the blighter strafed, but not on Christmas Day of all days."

"Well, he's got to have it one day, and why not on Christmas Day as well as any other? He's a good enough sportsman, but what about that grenade he dropped into the mess tent last week—the one that did in our last bottle?"

"Oh, well, strafe the blighter if you can. I suppose he deserves it. He's been asking for it long enough." You will gather that we had quite a personal regard for Fritz. We had, because this was in one of the side-shows of the war where we had opportunities of getting to know who we were up against. "Fr tz" was the solitary airman the enemy had at this time. We hadn't any—but that is by the way. He was a good chap in his way. Didn't mind taking risks, and had quite a keen sense of humor—for a Hun. We hadn't any guns up there that he cared about, and rifle fire didn't worry him at all, so he used to come down to a thousand feet, or even less, and drop a couple of 4-inch shells—he had no *pukka* bombs—some days, and on others he sprayed us with rifle grenades or darts. Not that he did much damage, but he used to get us on the raw sometimes.

Now, a shell when dropped from aeroplane must obviously have some sort of attachment to ensure that it shall drop business end first, so Fritz used to have long calico streamers lashed to his projectiles by way of a tail. Crude, possibly, but very effective.

Christmas morning, and the sun has just begun to make himself felt. Tommy has seen that his guns are in position and the gun crews standing by.

We are discussing the chances—will he drop in on us, or is he keeping Christmas somewhere Windhuk way? The answer isn't long in coming. A bugle blares out the alarm, and we rush out to see what is happening. Sure enough, there is a speck in the Eastern sky, and in another five minutes we can hear the drone of an aeroplane engine and with the glasses can see the outlines of the Aviatik.

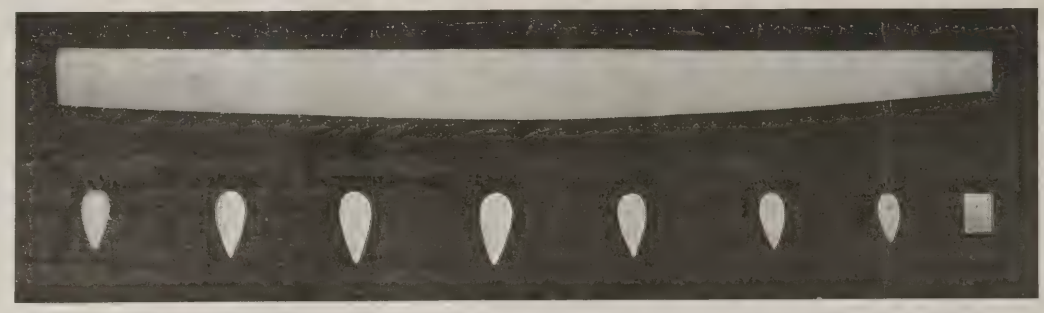
"What's he got for us today—shells or darts? Anybody want a *d.* bet about it?" says the sporting sub. "Lay you 5 to 3 Tommy doesn't get him."

By this time Fritz is over the camp. He is flying higher than usual, well out of machine-gun range, so Tommy doesn't loose off at him. When he is well over, we see something leave his machine, but curiously he doesn't seem to be aiming at anything but open ground. Obviously, that something is a shell, for we can see the streamers. As it falls and we are able to take in the details the whole camp bursts into one uncontrolled howl of laughter. Even the staid old General finds it too much for his gravity, and simply rolls on the ground shrieking and holding his sides. For the tail of Fritz's shell had spread out into a snowy bifurcation, with fluttering blue ribbons and all! Where he got the garment I don't know, but I know who has it now. Of course, the shell was a "dud," and as soon as it landed there was a wil drush for it—everybody wanted the "souvenir." If ever you go to South Africa you can see it—or perhaps I should say "them"—if you should happen to know the Witwatersand Rifles. They got it, and the "streamer" now decorates their mess-room. It was a cheery Christmas after—and we drank Fritz's health at dinner.

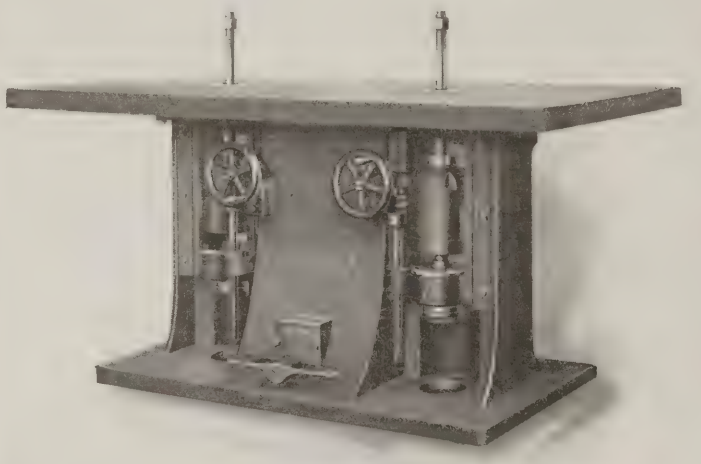
TWO DOUBLEYOU.



While the mercury is tickling the feet of the thermometer it is consoling to look forward to those days as represented by the above.



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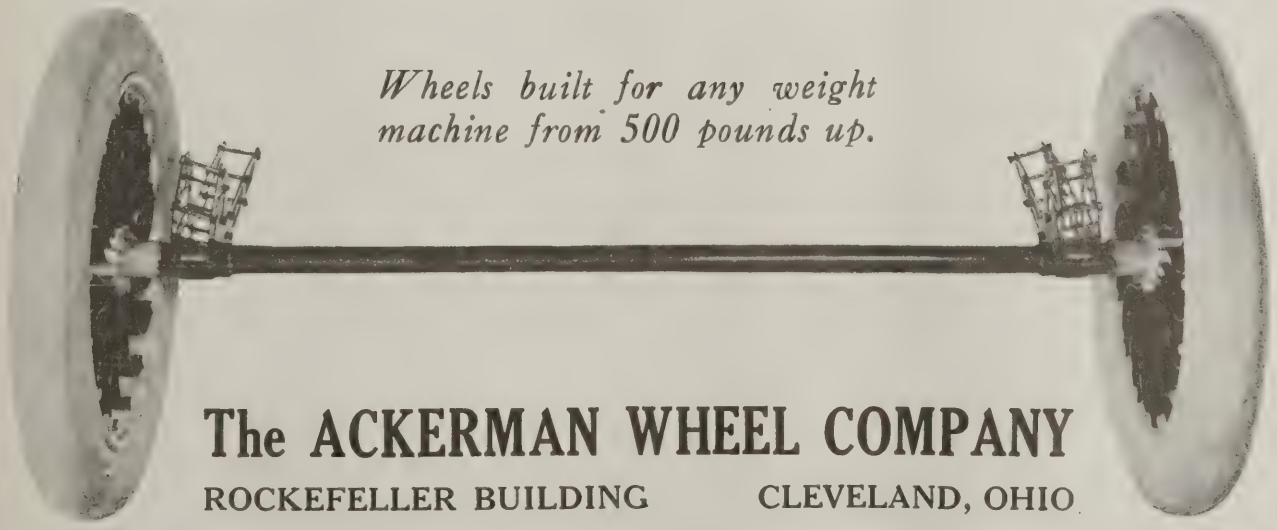
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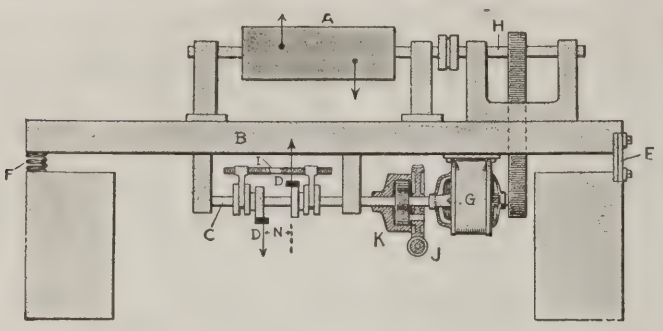
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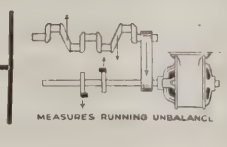
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3. Technical contributions from leading authorities in the aeronautic world on aeroplanes, aero-motors and every other phase of aeronautics.
4. The complete official reports of the Army and Navy Air Services and published weekly together with articles by authorities on Military and Naval aeronautics, thereby insuring to the readers and advertisers a more complete representation of Army and Navy aeronautics than is afforded by any other publication in the United States.
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10. A specially appropriate department in the French and English languages, giving valuable information and tables, which our men who go overseas find most advantageous.
11. Last, but not least, a page of aeronautical humor in verse, prose and illustration.

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2. By **the Executive, Engineering and Purchasing Military Authorities** of the United States and the Eighteen Allied Countries, and nine Latin-American countries who have severed their connections with Germany.
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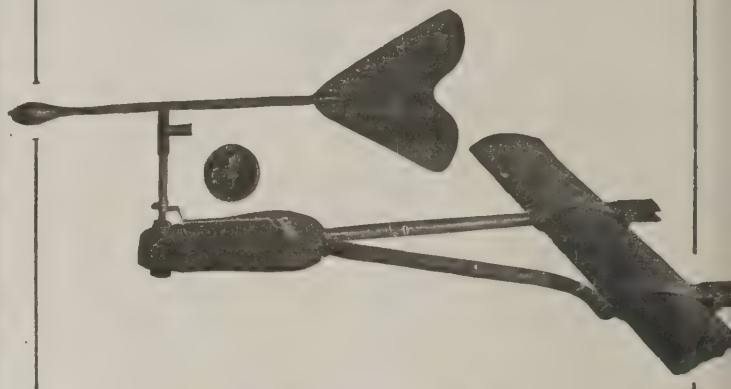
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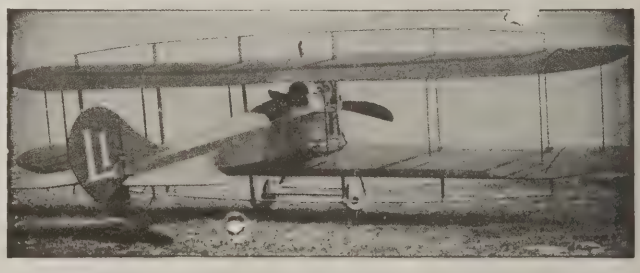
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VOL. VI. NEW YORK, JANUARY 14, 1918 No. 18

THE AMAZING DEVELOPMENT OF MILITARY AERONAUTICS IN 1917

Changed From Auxiliary of Armies and Navies to a Separate, Independent Factor More Dominant than any Other Single Arm

By HENRY WOODHOUSE

Member, Board of Governors, Aero Club of America, Author of "The Text-Book of Naval Aeronautics," etc., etc.

A DETAILED review of the amazing development of military aeronautics in 1917 would fill several good sized volumes.

During the past twelve months there has not only been a continuous increase in the number of aircraft used as auxiliaries of every branch of the military and naval establishments, but there has been an extensive use of large aeroplanes for operations conducted independently of the armies and navies and the success was so great that the world's leading strategists now agree that the Air Service is a more dominant factor than any other single arm.

Supremacy in the Air Key to Messines and Cambrai Victories

The Allies' temporary supremacy in the air on the Western Front was the key to the Messines and Cambrai victories; and the lack of two hundred additional warplanes would have prevented the German occupation of the Russian and Baltic Islands and the Italian reverses.

Russia's inability to check the German naval operations which resulted in the Germans capturing the important islands of Dago and Oesel and resulted in the loss of the large Russian Dreadnaught "Slava" was due more than anything else to the lack of 200 additional fighting aeroplanes with which to defeat the German Zeppelins and aeroplanes which directed the operations of the German forces.

Had they been able to maintain their aerial supremacy, the Russians could have prevented the blockade of the Gulf of Riga and Moon Sound and the landing of troops on the Dago, Oesel, Runo and Moon Islands, which resulted in the capture of 10,000 Russian troops and 50 cannons.

It was known that the Russians had only a handful of aviators to protect the group of Baltic Islands which lies between the Gulf of Finland and the Gulf of Riga, off the Esthonian Coast. That they fought the German aerial forces was shown by the reports which state that two German aviators were shot down.

The aerial engagements between the German and Russian aerial forces preceded the naval engagement. It took place on the northern coast of the Island of Dago, to which Germans came from the open sea. Having disposed of the few Russian aviators, the German naval forces could operate unhindered, using their Zeppelins and aeroplanes to direct their ships, which located the entrance to Moon Sound, protecting the ships from British and Russian submarine attacks. The blockade of the entrance to the Moon Sound between Dago Island and Oesel Island, which was supposed to be well fortified, seems to have taken effect without any fighting.

The next step of the Germans was to force the entrance to the Gulf of Riga to the south of Oesel Island. Ever since the Germans captured Libau, the important Russian naval base on the Baltic, it was obvious that their next step would be to attempt the forcing of the entrance to the Gulf of Riga.

The German operations from the start were directed by Zeppelins and aeroplanes. It was an easy task because the area of danger from Russian and British submarines was small, extending only to the entrance of the Gulf of Finland and the entrance between the Oesel Island and the mainland. It is evident from the fact that the Germans landed their troops on the Karsar Bay side and from the Gulf side of the Oesel Island that they expected submarine attacks. Therefore, they selected as a landing place for the troops the places which could best be protected from the Russian and English submarines.

One hundred fast combat planes and one hundred large torpedoplanes and bombing warplanes could have protected these important Russian positions better than their many cannons and warships. The fast fighting machines would have kept the sky clear of German aeroplanes and the torpedoplanes and the bomb dropping machines could have inflicted tremendous damage on the German fleet, sunk the transports and torpedo boats and damaged even the largest ships. At all events, they could have prevented the carrying out of operations by their continuous attacks on them.

With 100 more large warplanes, the Italians could have prevented the Austro-German advance, by destroying the supply bases in the rear and the transportation lines, and attacking the enemy with bombs and aeroplane guns. Italy had the manufacturing facilities and the trained men and women to build at least two thousand additional warplanes, but did not have the necessary raw materials and coal.

The Work of the French, British, Italian and American Air Services

The work of the Allies' aviators during the past year has been tremendous. The exploits of the pilots of combat planes were equalled in effectiveness and brilliancy by the work of the pilots of warplanes, seaplanes doing submarine patrol, contact patrol, etc.

There are twenty-eight different functions for aircraft in connection with military and naval operations and there have been brilliant exploits in each of these different lines.

With the death of Captain Guynemer, who had brought down 53 German aviators, and the retirement of Major Bishop of the Canadian Flying Corps, who had brought down 57 German planes, and the death of Captain Ball of the British Royal Flying Corps, who had also brought down over 50 Germans, the record for the number of enemy brought down has gone to Captain Baracca of the Royal Italian Flying Corps, who has brought down 36 German and Austrian aviators. Next to Captain Baracca is Lieut. Nungasser, of the French Flying Corps, with a record of 3 followed by Captain Heurteaux, also of the French Flying Corps, with 21 Germans to his record.

The American aviators connected with the Lafayette Flying Corps continue their splendid work. Lieut. Lufberry—now Major in the American Air Service—has 15 Germans to his credit.

Sir Eric Geddes, First Lord of the Admiralty, in the course of a speech in the House of Commons on October 31st, gave the following resumé of the work of the Royal Naval Air Service:

"Since the outbreak of the war the personnel of the Royal Naval Air Service increased from 700 to 41,000. The duties of the Royal Naval Air Service are varied, of great value, and of absorbing interest. Its great efficiency and gallantry in France are occasionally brought to public notice by reports of the bombing expeditions and otherwise. But any statement on the Navy would be incomplete without a tribute to the Royal Naval Air Service in operations over the sea. They are the terror of the submarine, and during one month the aircraft patrol around the British coast alone is more than five times the circumference of the earth.

"I think it may interest the House and instruct the public if I give some indication of what the Royal Naval Air Service alone has done in bombing behind the enemy lines in France. During September alone sixty-four raids were carried out on dock yards, naval depots, enemy aerodromes, and other objects of naval and military importance in Flanders behind the enemy lines. No less than 2,756 bombs were dropped by the Royal Naval Air Service alone, totalling 25 tons of explosives. The figures for October are not yet completely tabulated but are still greater. There is no doubt that these raids result in great material and moral damage, and on many occasions their effect is shown in the aerial photographs to be such as to hamper and restrict seriously the enemy naval, aerial and military undertaking."

In the House of Lords, Earl Curzon on October 29th gave the following account of the British Air Service's work:

"When we are dealing with the Royal Flying Corps or either of the services, I deliberately say that nowhere in this country has the spirit of knight errantry been more conspicuously shown. When in August, 1914, 100 officers and 77 machines made their way to France, who could have foreseen that they would have developed into a great fleet of thousands of machines and tens of thousands of men. On the Western front in the first nine months of 1917 the men of the Royal Flying Corps brought down 876 enemy machines, they drove 759 out of action, 52 were brought down by anti-aircraft gunners; thousands of tons of explosives were dropped on aerodromes, bridges, railways, lines of communication, and even of marching regiments. Apart from offensive operations and activities of the air service, they are the eyes of the Army in the field. Then we must not forget the airmen at home, who have shattered the enemy's Zeppelins, and by their skill and bravery on many occasions have brought those great gasbags in flames to the ground. I sometimes think when Gothas are shrieking over London, and when the civil population are cowering in their cellars, we might give a thought to those brave men who are riding in the darkness above and risking their lives to save us from destruction. I include in the same tribute the officers and men of the Naval Air Service. There is no distinction between the two services. At the beginning of the war the personnel of the Naval Air Service was 800, and now it is 42,000. Its fleet in August, 1914, consisted of seven airships, 30 aeroplanes, and 34 seaplanes, whilst the number is now many thousands. The most effective branch of the service has been the naval squadron of Dunkirk, from whence it has bombed aerodromes and his diminished and at times stopped the aerial invasion of our country. They have flown over Damascus, dropped bombs on Beyrut, destroyed buildings in Constantinople, and their flight to the Lake of Constance in the early part of the war and destruction of sheds there will be remembered."

In the struggle for the supremacy in the air, there have been developed remarkable large warplanes and small combat planes, torpedoes to be launched from aeroplanes, improved aircraft guns, huge depth bombs for submarine hunting and regular bombs; numerous instruments and devices intended to make aircraft more powerful as war weapons.

(*Continued on page* 791)

WALTER CAMP'S PLAN TO QUADRUPLE FIGHTING EFFICIENCY OF AVIATORS

A PLAN which would quadruple the fighting efficiency of American aviators and would probably have saved the lives of at least two hundred of the thousand Allied aviators who were brought down in aerial fights with Germans during the past year, has been developed by Mr. Camp, member of the Navy Department Commission on Training Camp Activities with the co-operation of the officials of the Aero Club of America.

Recently it occurred to Mr. Walter Camp, who has been a foremost leader in American athletics for many years, and is a member of the Aero Club, that the aviator is really the quarterback of the war's gridiron and that therefore, it is most important to give the same care and attention to his health and general physical condition as is given to the quarterback of a good team.

He took up the matter with Messrs. Alan R. Hawley, president, and Henry Woodhouse, member of the Board of Governors of the Club, and was almost startled when they told him that his plan meets a most immediate and important need, as it will not only quadruple the fighting efficiency of our American aviators, who will have cost about $35,000 each, by the time they cross the fighting lines, but would have saved the lives of about two hundred of the thousand allied aviators who were brought down by the Germans in air fights during the past year.

Mr. Walter Camp's plan is simple. It consists of two parts, as follows:

(1) A set of especially thought out setting up exercises intended to produce complete coordination of the nerves;

(2) Putting a trainer in every Aero Squadron who will look after the physical condition of the aviator exactly as a trainer looks after the members of a ball team.

Mr. Henry Woodhouse explains the tremendous importance of this plan by defining the very intensive work of the aviator in aerial fights, as follows:

"Every aviator on active service at one of the fronts is apt to be set upon by two or more boche aeroplanes coming at him from different directions, or by a single boche diving upon him from a height, firing as he dives, having every advantage against him!

"The aviator, whether he is in a single seater combat machine going at a speed of from 110 to 130 miles an hour, or a two or three seater photography, artillery "spotter," bombing or contact patrol aeroplane going at a speed of from 95 to 110 miles an hour, his chances of surviving depend essentially on quick decision, quick translation of decision into action, lightning motions of wrist and arm in the operation of the aeroplane controls, machine gun mounting, machine gun holder and trigger.

"If he is in either a photography, artillery spotting, bombing or contact patrol aeroplane—which constitute about eighty per cent of the aeroplanes used at the Western front today—by a single fast combat machine, he must simultaneously (1) Turn the horizontal circular gun mounting on its bearings, to bring the vertical gun holder in the direction of the enemy aeroplane; (2) raise or lower the vertical gun holder to make possible better shooting at the quick moving target; (3) move the gun on the universal joint and aim it at the target; (4) pull the trigger.

"These many motions must be done with lightning speed, while his own aeroplane may be diving, turning or climbing at very sharp angles, dodging the attack of another aeroplane and the shrapnel of anti-aircraft guns. And he is straped to a small seat by a strap around his waist and working in a small cockpit, with only a few inches of elbow room.

"It is hardly necessary to point out that loose joints are a valuable asset in such a case and that a second saved in decision or motion makes the difference between life and death.

"The same is true if he is piloting a single seater fast combat machine, although the motions are different. His gun or guns instead of being mounted on a tower are mounted—in the case of the four gun Nieuport or Spad—two on top of the top plane and two parallel with the engine, fixed and shooting through the propeller. If attacked from above, it is a question of trying to dodge the fire either by a half or complete loop, or zig-zag, a sharp turn or climb, or turnover, or almost anything else, for the instant, while the boche dives, he dives and then tries to get to a point of vantage to shoot at the boche. If there are two boches, the actions must be litterally 'double quick'; operating the aeroplane controls, the top guns and the fixed guns almost simultaneously.

"Attacking a Boche Aeroplane."

"In attacking boche aeroplanes everything depends on hitting the vulnerable place in the one instant when the machine is in range or has exposed one of its 'blind' sides—the sides

which are not protected by the gun's arc of fire. Failure to do so means having to manoeuvre again for a point of vantage which may never again be secured.

"Besides, boche aeroplanes have the way of appearing in the sky very much in the same way as sea-gulls appear at sea and the aviator who misses his chance may have to face two boches instead of one—and lose out.

"Costs from $10,000 to $20,000 to Train an Aviator"

"It costs an average of $1.50 a minute for the 100 to 200 hours of flying which an aviator gets before he is a crack military pilot. It takes 50 hours of flying before an aviator can get his Reserve Military Aviator Certificate, and 80 hours for the Junior Military Aviator Certificate. After that he must get the advance training in fast machines and the experience in shooting balloons, and in other ways to prepare him for aerial combat.

"Every one of the thousands of American aviators being trained at present will cost between $10,000 and $20,000.

"Every Aero Squadron Should Have a 'Trainer' to Look After Aviators"

It is a fact that the members of a team will tell the trainer about his own condition, but will not tell the coach.

"The trainer keeps in close touch with the members of his own team and looks after their welfare. Whenever a member of a team is under weather, the trainer tells the coach and recommends a substitute and at the same time takes steps to get the man back in good physical condition.

"A trainer is badly needed for every aero squadron to take care of the aviators, just as the trainer takes care of the members of his team. It is particularly necessary to have a trainer who will tell the squadron commander about the physical condition of the aviators and will prevent sending up for aerial fights aviators who are not entirely fit or temporarily indisposed.

"An aviator will no more tell the squadron commander that he is not in condition to go up than a member of a team will tell the coach that he is not fit to play. In both cases they are afraid of being considered 'yellow'. Therefore there must be a trainer to look after them and speak for them.

"Having a Trainer in Each Squadron Would Bring Large Economic Saving"

"Mr. Camp's system promises to quadruple the efficiency of our aviators and at the same time bring about a large economic saving in aeroplanes, motors and propellers, which are last at present, due to very small causes, which may be obviated to a great extent by giving the aviator such training.

"For instance, an Aero Squadron of only twelve aviators will use in the course of a year about 80 aeroplanes, about 90 motors, and about 150 propellers and as many magnetos. A light twist to the control as the pilot is landing makes the difference between not breaking anything or turning over and wrecking the machine. We may assume that that light twist will not be given if the pilot's mind is clear and his nervous system fully co-ordinated and under control."

"Two Hundred Allied Aviators, Whose Training and Equipment Cost $3,500,000, Could Have Been Saved in Past Year"

"Germany claims to have brought down over one thousand Allied aviators in the past twelve months," said Mr. Alan R. Hawley. "We may easily take for granted that one-fifth of this number could have been saved by the advantage which the Walter Camp system of physical training gives to a man. Not figuring the intrinsic value of the hundred aviators for the supremacy in the air which they might have brought to the Allies, we find that their training, at an average of $15,000 each, amounted to $1,500,000 and that their aeroplanes cost about $13,000 each for combat machines equipped with high horsepower, and $18,000 each for twin-motored machines with an additional cost of $750 for each gun, and about $1,000 for other equipment and instruments. The total may be figured roughly at $3,500,000 actual cash. As already stated, the value of one hundred aviators to the Allied cause cannot be estimated.

"The Walter Camp system of physical training for aviators will make it possible to quadruple the fighting capacity and efficiency of everyone of our aviators. It is invaluable to the cause of the Allies and worth tens of millions in actual money to the United States. It should be adopted promptly and a trainer attached to each Army and Navy aeronautic station and camp."



THE NEWS OF THE WEEK



Baker Asks Appropriation for Aviation Fields

Secretary of War Baker has requested Congress to allow $50,000,000 for the establishment of air bases. Sixteen aeronautic stations are to be erected in the United States at a cost of $24,000,000 and also twenty balloon stations at an estimated cost of $3,500,00 each. A station is to be built at Hawaii costing $4,220,000, and another in the Panama Canal Zone estimated at $5,420,000. The equipment of these stations is to add another $12,000,000 to these figures.

Call for Non-Flying Branch of Aviation Section Made by Captain Grace

An announcement was made by Capt. N. Grace of the Signal Reserve Corps, 104 Broad street, and reads as follows:

"The United States Army requires the services of graduates of recognized technical schools of at least one year's experience in the construction and repair of gasolene engines. Such men, even though of draft age, who can pass the necessary physical, mental and professional examination can be recommended for commissioning direct as second lieutenants in the Signal Reserve Corps, Aviation section.

"There is also need for men who can qualify as gas engineers who are not graduates, but who are experienced and who can pass the necessary physical, mental and professional examinations. Such men even though of draft age may be recommended for commissions as second lieutenants in the Signal Reserve Corps, Aviation Section after a suitable course of training.

"There is also need for highly qualified non-flying officers to fill such positions as that of adjutants and supply officers. Such men must be over draft age and should not be over 36.

"Applications should be made to the president, Aviation Examining Board, 104 Broad street, New York City.

Navy Air Service Wants Motor Experts

Men with practical experience in constructing and repairing automobile engines are in demand for ground service in the Navy Flying Corps. An excellent opportunity is offered at the present time in order that the talents of men expert in this work may be utilized in preparing and maintaining sea planes.

After instruction enlisted men are eligible for appointment as first and second class petty officers in the Naval Flying Corps. On the basis of ten men to every flyer, about 8,000 mechanicians will be necessary to complete the organization of the corps.

A Correction

It is desirous that we counteract the erroneous impression which has been created by the statement which appeared in the AERIAL AGE WEEKLY of December 24th on page 657, headed "Opportunity for Aviators Rejected by American Air Service. The AERIAL AGE WEEKLY, therefore, inserts this paragraph contradicting the statement made in letter addressed to the Philadelphia Aero Club by the officer in charge of the recruiting office of the Royal Flying Corp, Major Lord Robert Innes Ker, that there is no authority for the statement that Americans between the ages of 18 and 30 who have been rejected by the American aerial service will be accepted in the Royal Flying Corps.

New Works Manager for Duesenberg Motor Corporation

Mr. L. E. Joels has been made works manager for the Elizabeth plant of the Duesenberg Motor Corporation, following the resignation of Mr. Charles B. Page.

Mr. Joels has had a very wide experience in factory production and factory management, having recently resigned as Works Manager of the Packard Motor Car Company.

New Superintendent at Rich Tool Works

E. F. Lake, metallurgical engineer of Detroit, has taken the position of superintendent of the Rich Tool Co. of Chicago This company is manufacturing one-piec valves from high speed steel for aeroplanes and automobile engines. It is also making valves from a high chromium steel similar to the stainless steel recently placed on the market.

Petroleum War Service Committee Reports on Gasoline Supply

The Petroleum War Service Committee has issued a report on the stock of gasoline in this country which contradicts previous rumors of a grave shortage to be expected for next summer. The committee points out that only 25 per cent of the gasoline supply was shipped abroad and that the lack of tank ships has prevented any large increase in the proportion sent abroad for the present. The light winter demand will increase the reserve stock

Although there is an increasing demand abroad for war purposes, not only for use by our Allies, but by our own Army and Navy, the shortage of tonnage suitable for shipment of gasoline has restricted the amount exported. The fuel oil situation, however, is more serious, because of its enormously increased use for the Navy, merchant ships and numerous other war purposes. As fuel oil is a by-product of crude oil when gasoline is extracted, increased use of gasoline will only serve to increase the supply of fuel oil. Hence the committee reports that there is no immediate need for restricted use of gasoline.

Henry Woodhouse Writes for "Everybody's"

In the January issue of *Everybody's Magazine* appears a well illustrated eight page article on "Training our Army of 'Eagles.'" Mr. Woodhouse, who is a member of the Board of Governors of the Aero Club of America, and editor of *Flying*, covers the subject fully from various angles. He takes up the work of the ground schools, the life of the aviator, his training aboard, the final tests, and the adventures of the various famous pilots. This comprehensive article shoud be of interest to prospective members of our air services.



Training tractor of the type to be constructed by the Anglo-American Corporation. Photo passed by censor.

Army Balloon Makes Record

A balloon carrying five army men from Omaha landed at Sartell, five miles north of St. Cloud, to-day, making, it was declared here, a new army record for time and distance. The balloon left Fort Omaha at midnight and landed 9:15 o'clock the following morning, approximately 550 miles away. Lieut. McKinley was in charge.

First Group of Young Pilots and Observers Turned Out by the American School.

According to the Associated Press the entire American expeditionary force by to-day had resumed training, which is not to be relaxed hereafter unless unforeseen developments occur. The newly landed divisions of former National Guardsmen began active work in hand grenade training, their instruction going on despite the snow, which to-day covered the ground in some place to the depth of a foot. Other former guardsmen who had been found to be good marksmen were picked for sniping work and began learning the finer points of that practice.

A division of regular army men which already has been at the front resumed to-day the carrying out of manoeuvres, during which aeroplanes co-operated with the artillery. This division is rapidly nearing the point where it will be classed as expert in this co-operation, and the aerial observers are becoming equally efficient. Both 75s and guns of larger calibres are being used.

The weather is clear and cold, and except for the snow on the ground conditions are ideal for instruction purposes.

The first group of young pilots and observers to take a course of instruction in the American flying school nearest the battle front in the Woevre completed its work to-day. After a rest of a week the squadron will be sent to the front, where the finishing touches will be added under actual battle conditions. The work at the front will be carried out under the guidance of veteran French aviators.

For many weeks the aviators have been flying over the American zone, taking instruction in their various duties, including aerial photographic work and observation. All the men are useful, energetic, and enthusiastic, and are said by their instructors to have shown remarkable aptitude. Only one member of the entire class under instruction failed to measure up to all standards.

The members of the squadron to-day showed their ability to overcome difficult conditions of ground. In getting away on their final instruction trip they set forth from a field covered at some places with three feet of snow. All the men made successful landings after a flight of an hour and a half.

Handbook on Meteorology Relating to Aeronautics

The National Advisory Committee for Aeronautics has just issued a pamphlet entitled "Report No. 13—Meteorology and Aeronautics." It is a handbook in which are discussed the properties and general phenomena of the atmosphere which aeronauts and aviators should understand. This report was prepared by the subcommittee on the Relation of the Atmosphere to Aeronautics, of which Prof. Charles F. Marvin, Chief of the Weather Bureau, is chairman.

In particular the report deals with the physical properties and dynamics of the atmosphere, topography and climatic factors in relation to aeronautics, and current meteorology and its use.

Copies may be had on application to the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C.

Secretary Redfield Says Aeroplanes Can Injure Germany by Bombing Rhine Valley

Secretary of Commerce Redfield, in his statement for the Annual Financial Review of the *Evening Post*, discussing the commercial situation after the war, writes : "A few hundred American aeorplanes dropping bombs in the Rhine Valley might alter the German outlook toward 'after the war' trade."

Germany now has merchant ships loaded with products, ready to sail the instant peace comes. But if her great industrial centers in the Rhine Valley are destroyed by bombing aeroplanes, she will not only be unable to fill her present war needs, but it will be impossible for her to regain her commercial prosperity after the war.

Anglo-American Corporation to Turn Out 1,000 Aeroplanes

The Anglo-American Corporation, of 42 Broadway, New York City, has obtained the control of a complete and efficient organization for the construction of aeroplanes, with a possible output of 100 machines a week.

The plant is now making aeroplanes designed by their own engineers. They are tractor biplanes, of a type somewhat similar to the kind now being used by the United States Government to train the thousands of aviators who are to give the finishing touches of discomfort to the Germans before the day of settlement.

Inherent stability and a large factor of safety are the most important requirements in heavier-than-air machines intended for continuous use. These two features are very thoroughly carried out both in the design and in the construction of this aeroplane, pictures of which are shown in this issue.

With its present staff of between 1,500 and 2,000 expert wood-workers, and over 1,500 metal workers (not including the assembling staff), there is no doubt that the organization will be able, within the next two months, to deliver aeroplanes at the rate of 50 a week.

The assembling plant alone covers something like twenty acres, and for transportation there is a railroad along the entire length of one side, with a switch running through the plant; over 1,000 feet of water front on another side, and two highways on each of the other two sides.

The entire plant and organization was recently inspected by experts of the United States Government, and was commented upon in most satisfactory terms. There was at that time, however, a fear that the element of speculation was underlying the enterprise, and that was probably what militated against securing the confidence and support of the Government. With the taking over of the control of the company by the Anglo-American Corporation, however, the danger of speculation has been definitely eliminated. The Anglo-American Corporation has undertaken to finance the business to the extent of two million dollars.

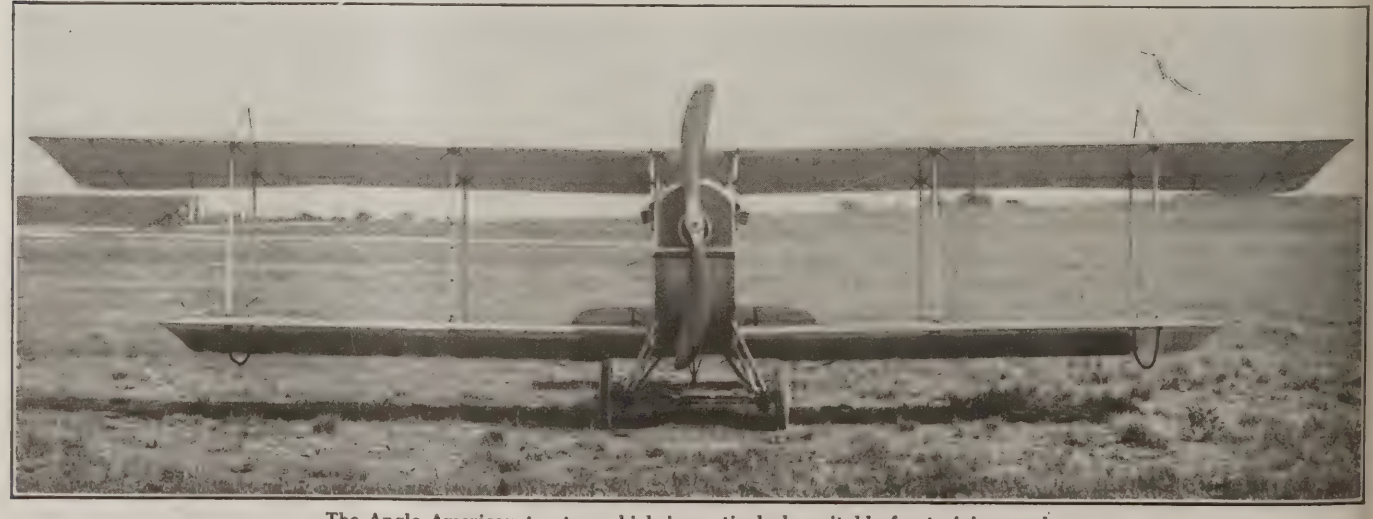
Negotiations are already on foot with the post office authorities, with a view to the aeroplanes being turned over to them for the establishment of aerial mail routes, which would, in addition to carrying mail between some of the most important cities, be used for carrying freight, passengers, etc.

Fire Insurance for Aircraft

As a result of an inquiry conducted by the National Advisory Committee for Aeronautics into the subject of fire insurance for aircraft, it was found that most of the fire insurance companies were not writing or contemplating insurance for aircraft.

One large fire insurance company has announced that it is now prepared to issue such insurance. It appears, therefore, that other companies will take similar action and that before long such insurance may be written generally.

Briefly, the new form of policy is a cover against fire while in flight or upon the earth, or upon any lake or river, or in or over the coastal waters of the United States, excluding Alaska, Porto Rico, etc. It will also cover the shipment of aircraft upon any railroad or other conveyance within the limits of the policy against burning, sinking, derailment or collision of the conveyance. Caution is advised to avoid the congestion of hangars which are usually remote from fire protection and sometimes built close together; they should be separated by proper distances.



The Anglo-American tractor, which is particularly suitable for training work.

General Petain Says American Aid is Becoming More Powerful Every Day

In the New Year orders of 1918, General Petain, Commander in Chief of the French Army, after praising the French troops for their valor during the past year, assured his troops that "the co-operation of the United States is becoming more powerful every day."

Standardization to Reduce Number of Parts Used in Aeroplane Construction

A recent statement from Washington reports that hundreds of parts in the construction of aeroplanes, and even when the built up section of the frame are regarded as single parts, there remain nearly 200 separate pieces to be assmbled into the complete machine.

These are the things necessary to build a machine without its engine:

Nails, 4,326; screws, 3,377; steel stampings, 921; forgings, 798; turnbuckles, 276; veneer, 37 square feet; wire, 3,262 feet; varnish, 11 gallons; dope, (for dressing wings) 59 gallons; aluminum, 65 pounds; rubber, 34 feet; linen, 201 square feet; spruce 244 feet; pine, 58 feet; ash, 31 feet; hickory, 1½ feet.

Sprague Electric Company has New Commercial Manager

Mr. Frank W. Hall has been appointed Commercial Manager of the Sprague Electric Works of General Electric Company. With the exception of a short period, Mr. Hall has been connected with the Sprague Works continuously for twenty-two years in various engineering and sales capacities, and for three years prior to his present appointment occupied the position of Sales Manager. Mr. D. C. Durland, former executive head of the Sprague Electric Works, has resigned to accept the Presidency of the Mitchell Motors Company, Inc.

New German Plane Said to be Fastest on West Front

With the word of America's great aerial program which brought good cheer to the allies, the Hun inventors, mechanics, and military experts have been pushed to capacity to improve their present models of aeros, as has been proven by the new models recently captured by the allies.

The new German Albatross is described as being the fastest now in use on the west front, attaining a speed of 130 miles an hour. The Teutons have copied the best features of the British and French planes in their construction of this aerial monster, and have added a few wrinkles of their own. The engine develops a horsepower of 175, furnishing the energy for the powerful propellers which send the machine along at a prodigious rate of 130 miles and over an hour.

The lower wing on the new Albatross is made shorter than the upper one, preventing "interference" or "catching" of air between the surfaces. The staggered wing construction makes it possible to fasten each triangluar strut to the lower main beam.

New Corporation Meets Demand for Magnesium

Previous to the war, our supply of magnesium was imported almost entirely from Germany, and as a consequence, when the supply was cut off, its price rose to a very high figure. Magnesium is used as an alloy with aluminum for aeroplane parts, as a de-oxidizer and scavenger for various metals and is used in powdered form for light bombs and flares for night attacks.

A new corporation is now producing magnesium in quantities at very little above the pre-war price, the name of which is the American Magnesium Corporation of Niagara Falls, N. Y.

Captain Persius, Military Expert of Berliner Tageblatt, say Submarines Have Failed To Starve England

Captain Persius, in an editorial in the *Berliner Tageblatt,* in replying to numerous letters of inquiry, regarding the success of the German submarine warfare, states that the early hopes entertained by extremists as to the possibilities of submarine warfare were exaggerated and that England's food question cannot become acute before January 1, 1918, and that this date will further be postponed by the fact that large importations of food are being successfully made.

"Just as the German people do not allow itself to be starved straight away, so it is with other people." The submarines are admitted to have a big task. This convincing and reassuring logic intended to calm German unrest, in reality is an admission of the success of the anti-submarine measures of the Allies, in which aeronautics have played such a very important role.

New Censorship Rules

The Committee on Public Information has drafted a new set of rules for the voluntary censorship of the press. In general, the requests have been made more lenient. The following sections deal with aeronautical information and their publication is prohibited:

"Information of the coast or anti-aircraft defences of the United States. Any information of their very existence, as well as the number, nature or position of their guns, is dangerous.

"Information of the aircraft and appurtenances used at Government aviation schools for experimental tests under military authority, and information of contracts and production of air material, and information tending to disclose the numbers and organization of the air division, excepting when authorized by the Committee on Public Information."

Resnati to Fly Diving Aeroplane

According to the New York *Sun,* Resnati is preparing to fly in a new Italian car that can dive under water as well as sail through the air. The machine is said to be the only one of its kind in existence, and when submerged can go much faster than a submarine.

Foreign Publications Criticize Exaggeration of American Air Program

Several European publications have pointed out that America's aerial program will not be in full swing before the middle of next summer and warn against the exaggerated reports of early American aid which have received much circulation abroad.

Godfrey Cabot Suggests Gasoline Saving Measure

In discussing a standard gasoline for aircraft, Godfrey Cabot, President of the Aero Club of New England, points out that no standard can be made for all temperatures and that there is a standard for every variation of temperature which is most efficient. For instance, Mr. Cabot has found 76 per cent gasoline best in summer and useable in winter, but 82 per cent is best in winter and not more expensive than the 76 per cent. He suggests that the government issue a circular stating what the best degree is for given temperatures, so that consumers may select the most efficient grade.

Automobile Man in Aviation Section

S. W. Kesler, formerly special representative of the Abbott Corp., Detroit, has received the commission of captain in the Aviation Section of the Signal Corps. He will sail for France at once.

Goethals Remains Wright-Martin Head

Major-General Goethals of the Quartermaster Corps will retain his position as president of the Wright-Martin Aircraft Corp., despite his new appointment as Quartermaster-General.

Tool Makers to Exhibit in New York and Chicago Auto Shows

The Taft-Peirce Manufacturing Company, Inc., will exhibit its gauges, tool room specialties, adjustable reamers and the Simmonds Magnetic Chuck at the New York and Chicago Automobile Shows.

The Simmonds Magnetic Chuck embodies some new features in magnetic chuck design and will be shown in surface and rotary types.

Rules for Enlistment in Aviation Section of Men Who Are in or Under the Draft Age

The Aviation Section of the Signal Corps authorizes the following statement to clear up any misunderstanding which may exist as to the enlistment of men in or under the draft age on account of the recent ruling discontinuing voluntary enlistment as a general practice.

Flyers and Balloonists

Flyers and balloonists may enlist as heretofore upon passing the examination at the nearest aviation examining board. Their relationship to the draft and to the draft board is seen to by the examining board. They themselves are ordered into active service as soon as possible and hold the status of privates, first class, Signal Enlisted Reserve Corps, with a salary of $100 a month, 60 cents daily allowance for food, and quarters provided by the Government, until their commissions are issued or they are discharged.

Nonflying officers of draft age or below are not being accepted for service, except a limited number of graduates of recognized engineering colleges or others who can qualify as expert engineers; others may, if they wish, have their names placed on file at an examining board.

Aerial observers are not now being accepted, whether of draft age or not.

Draft Age Enlisted Men

Enlisted men within the draft age may now no longer volunteer at a recruiting office, but may be inducted voluntarily into service by their local board if they are physically fit, sufficiently skilled, and not required to fill the current draft quota. They will be sent to Camp Kelly, Tex., for distribution into trades, training, and formation into squadrons, with ranks and salaries running from $30 a month as private to $81 a month as master signal electrician, food and quarters provided by the Government.

Army Balloon School Classes

The following named enlisted men, Signal Corps, upon completion of their course at the school of military aeronautics and graduation with their classes will be sent to the Army Balloon School, Fort Omaha, Nebr., for the course of training and instruction in ballooning:

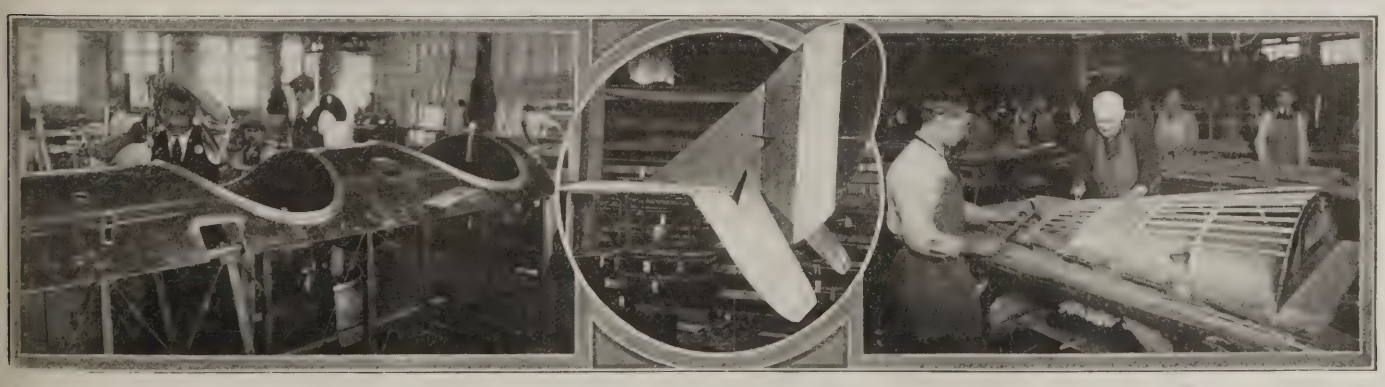
Texas State University, Austin, Tex.—G. C. Brown, Stanley Dolch, J. S. Donaldson, Nelson Goodenough, Rufus T. Martin and C. E. Hartford.

Georgia Institute of Technology, Atlanta, Ga.—D. Milligan, C. T. Roberts, V. H. Burgin, W. C. Maxwell, P. P. Steinhart and Fairfax K. Dillon.

Cornell University, Ithaca, N. Y.—G. H. Kenyon, L. F. Paszek, L. R. Robbins, H. D. Smith, G. H. Schanfield and Abott Markell.

Americans Allowed Transfer to Pershing's Forces

According to recent cable from Paris American volunteers serving in any branch of the French army may hereafter apply to any American camp and secure their transfer to the United States Army. A circular to this effect is now being distributed throughout the French army.



Assembling the cowl of war aeroplanes. Tapering the fuselage behind the pilot is said to have added 10 miles an hour to the speed of single seater fighting machines. The center picture shows a complete "flipper," as pilots call the elevators. (Passed by Censor.)

NAVAL and MILITARY AERONAUTICS

Commissions Issued to Several Americans Who Have Been With Lafayette Escadrille

The Adjutant General of the Army, acting upon the recommendation of General Pershing, has issued commission to the following American citizens who have been with the Lafayette Escadrille of the French Army. Gen. Pershing recommended commissions in the Aviation Reserve of the United States Army, and his recommendation was followed by the issuance of commissions as follows:

As majors—William Thaw, John F. Huffer and Victor R. Lufbery.

As captains—Charles J. Biddle, Phelps Collins, Kenneth P. Littauer, Walter Lovell, David McK. Peterson, Robert Soubiran, Robert L. Rockwell and Kenneth Marr.

As first lieutenants—Paul F. Baer, Willis B. Haviland, Charles M. Jones, Granville A. Pollock, Leland L. Rounds, Joseph C. Stehlin, George E. Turnure, Jr., Frank W. Wells, Charles H. Wilcox, Charles C. Johnson, Charles H. Donal, Jr. and Henry S. Jones.

As captain for service as instructor—Dudley L. Hill.

Special Orders 296-297

First Lt. Dewitt S. Burnett, S. R. C., is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for assignment to duty. The travel directed is necessary in the military service.

First Lt. E. F. Lenihan, Av. Sec, S. R. C., is assigned to active duty and will proceed without delay to Portland, Ore., and report on arrival, to Col. B. P. Bisque, S. C., Yeon Building, for assignment to duty. The travel directed is necessary in the military service.

Second Lt. Edward Mullen, S. R. C., is assigned to active duty and will proceed to Lonoke, Ark., and report in person to the commanding officer for assignment to duty. The travel directed is necessary in the military service.

First Lt. W. S. Piggins, Av. Sec., S. R. C., is assigned to active duty and will proceed to Greenville, S. C., and report in person to the commanding officer, Camp Sevier, for duty. The travel directed is necessary in the military service.

Capt. Frederick H. Brooks, Av. Sec., S. R. C., is assigned to active duty and will proceed to Philadelphia, Pa., for temporary duty with the aviation examining board and upon completion thereof will proceed to Portland, Me., to take station as a member of the aviation examining board at that place. The travel directed is necessary in the military service.

Capt. Cameron B. Waterman, Av. Sec., S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer, Washington, D. C., for duty.

First Lt. Philip G. Thompson, Av. Sec., S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer for duty.

Second Lt. Frank W. McChesney, Av. Sec., S. R. C., is assigned to active duty and will report in person to the Chief Signal Officer for duty.

The following named officers will proceed to Richmond Va., and appear before the aviation examining board, 1222 East Broad Street, for physical examination to determine their fitness for aviation service; upon completion of examination they will return to their proper station: Second Lt. George S. Warren, 39th Infantry; Second Lt. Malvern J. Nabb, 7th Infantry; Second Lt. G. H. Gillin, 39th Infantry. The travel directed is necessary in the military service.

Capt. Julius Berman, S. R. C., is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for duty. The travel directed is necessary in the military service.

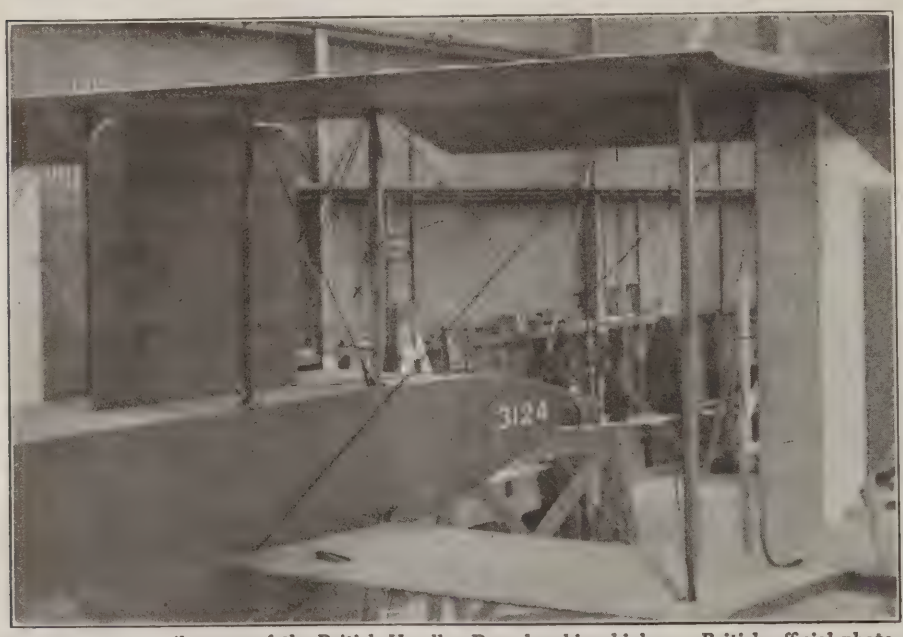
First. Lt. Wriston Charlie Alexander, Av. Sec., S. R. C., is assigned to active duty, and will report in person to the commanding officer, Balloon School, Fort Omaha, Jebr., for assignment to duty.

First. Lieut. Michael C. Regan, S. R. C., is assigned to active duty and will proceed to Little Silver, N. J., and report in person to the commanding officer, Camp Alfred Vail, for assignment to duty. The travel directed is necessary in the military service.

Extracts Special Orders 296-297

Second Lt. Lutellus Smith, Jr., S. R. C., active duty reporting to Chief Signal Officer for assignment.

First Lt. Conax Coppinger, Av. Sec., Sig. Corps, to Morrison, Va., for duty.



Empennage or tail group of the British Handley-Page bombing biplane. British official photo.

First Lt. Cedric A. Major, Av. Sec., S. R. C., active duty reporting to C. S. O., of the Army for assignment.

Capt. Veon I. Moncrieff, Av. Sec., S. R. C., active duty, reporting to C. S. O. of the Army for assignment.

Second Lt. J. M. Steockle, Av. Sec., S .R. C., and First Lt. Leslie P. Scott, Av. Sec., S. R. C., active duty reporting to the C. S. O., of the Army for assignment.

Second Lt. William Spoerle, Av. Sec., S. R. C., active duty reporting to C. S. O., of the Army for assignment.

First Lt. Charles S. Lee, Av. Sec., S. R. C., active duty at Ft. Kamehameha, Hawaiian Is.

Second Lt. Robert John Adams, Av. Sec., S. R. C., active duty reporting to the C. S. O. of the Army for assignment.

Previous orders directing Major Charles G. Benedict, Sig. Corps to report to Lage Charles, La., are revoked.

The resignation of Second Lt. Oliver H. Bechtel, S. R. C. has been accepted.

Second Lt. John W. Pope, Jr., Signal Corps, active duty at Morrison, Va.

First Lt. John M. Baker, Av. Sec., S. R. C., active duty at Fort Worth, Texas.

Second Lt. John P. Giblin, Av. Sec., S. R. C., active duty at Kelly Field, San Antonio, Texas.

The assignment of the following named officers to the Coast Artillery anti-aircraft batteries is announced.

Fifth anti-aircraft battery—Captain G. H. King, Artillery Reserve Corps; Second Lt. E. R. Campbell, Coast Artillery Corps.

Sixth anti-aircraft battery—Capt. P. H. Pittinger, Coast Artillery Reserve Corps; Second Lt. I. V. Henderer, Coast Artillery Reserve Corps.

Special Orders 299

The following named officers, Signal Reserve Corps, are assigned to active duty and will proceed to Little Silver, N. J., and report in person to the commanding officer, Camp Alfred Vail, for duty: First Lt. Watt G. Higginbotham, First Lt. Edmund B. Thornton, First Lt. Patrick J. Nee, First Lt. Harry J. Lane, First Lt. Jesse O. Wagner, Second Lt. Elmer H. Humble, Second Lt. Julian Elliott, Second Lt. Thomas P. Dudley, Second Lt. Harry E. Olsen, Second Lt. Cyrus F. Mason, Second Lt. Carroll T. Blanck, Second Lt. William A. Bailey, Second Lt. Elmer D. Pangburn, Second Lt. Charles M. Clark, Second Lt. Ralph H. Bouligny, Second Lieut. Addis B. Albro, Second Lt. Robert W. Abright. The travel directed is necessary in the military service.

The following named officers will proceed to Little Silver, N. J., and report in person to the commanding officer, Camp Alfred Vail, for duty; First Lt. Joseph H. Harlin, Signal Corps, National Army; Second Lt. Arthur C. Druley, Signal Corps. The travel directed is necessary in the military service.

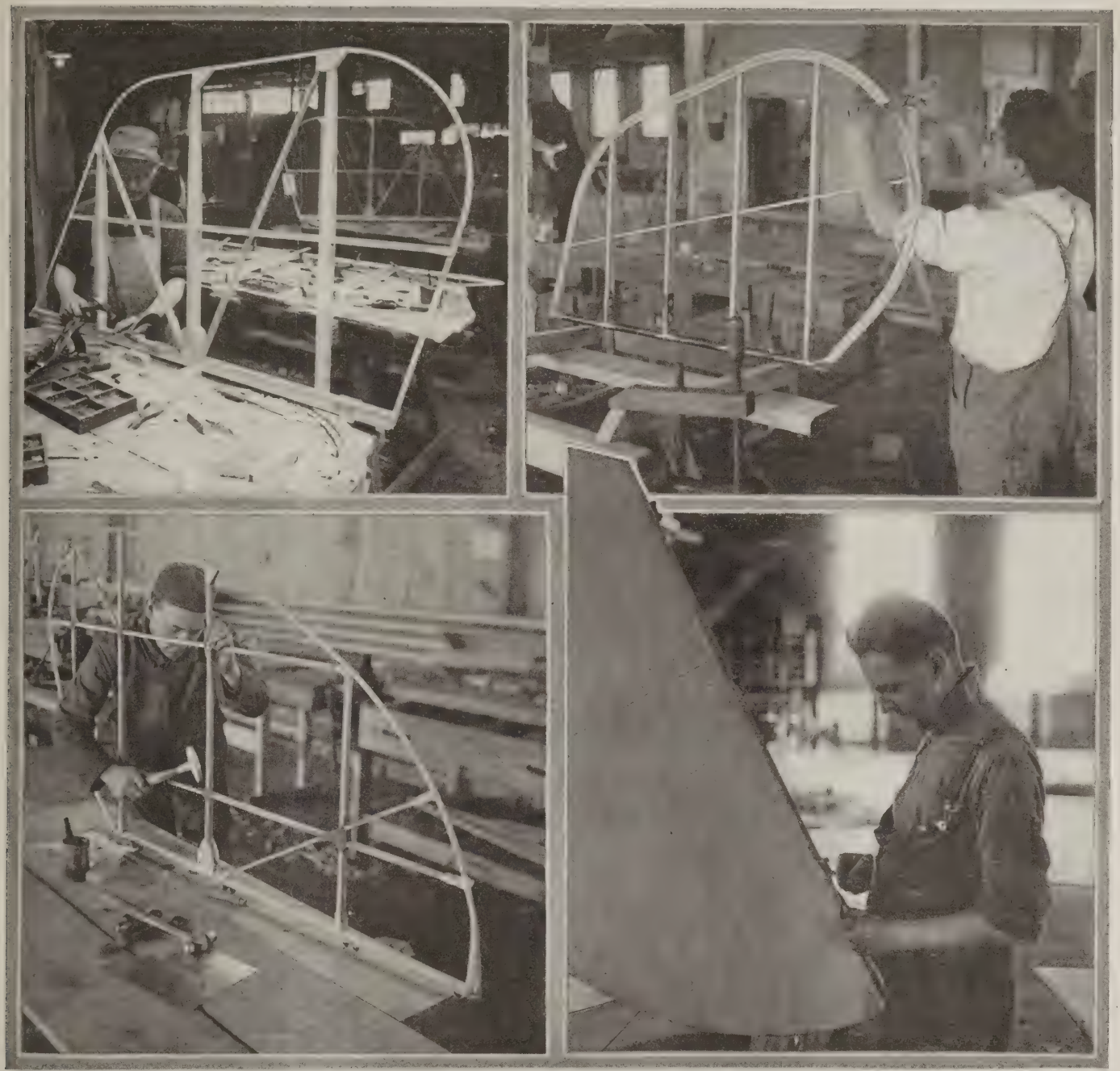
Captain Martin H. Ray, S. C. to Rockwell Field, San Diego, California, for duty.

The following named officers of the Medical Reserve Corps are assigned to duty with the Av. Sec., S. C., at Scott Field, Belleville, Illinois: Firts Lts. James G. Conley, John W. Dunn and Alexander W. Graves.

Lt. Col. Bion J. Arnold, S. C., to Chief Signal Officer of the Army, for duty.

First Lt. Raymond S. Dickinson, Av. Sec., S. R. C., to duty, Park Field, Millington, Tennessee.

The following named officers of the Medical Reserve Corps are assigned to active duty with the Av. Sec., S. R. C., at Kelly Field, South San Antonio, Texas: Capt. Grant S. Monical and First Lts. Leo L. Elliott, Enoch S. Fulton, Jesse J. Holmes, Marvin L. Turney and Charles B. Gant.



Various steps in rudder construction. The same care and accuracy must be observed in building rudders as in every other part that enters in the construction of an aeroplane. (Photos copyrighted by Committee on Public Information.)

The following named officers will appear before the aviation examining board indicated after their names, for physical examination to determine their fitness for aviation service: First Lt. John H. Jones, 40th Infantry, at 104 Broad street, New York, N. Y.; First Lt. Ira R. Simms, Infantry Reserve Corps, at Carnegie Building, Pittsburg, Pa.; Second Lt. Romeyn B. Hough, 48th Infantry, 1222 East Broad street, Richmond Virginia.

First Lt. Frank B. Scholl, S. R. C., active duty at Morrison, Virginia.

First Lt. Thomas D. Cope, Av. Sec., S. R. C., active duty reporting to the Chief Signal Officer for assignment.

First Lt. Maurice G. Cleary, Av. Sec., S. R. C., detailed member of Board of Officers under Paragraph 31, S. O. 244, October 19, 1917.

Second Lt. Frank R. Deal, Av. Sec., S. R. C., active duty at Morrison, Va.

Second Lt. David R. Dannar, Av. Sec., S. R. C., active duty reporting to Chief Signal Officer of the Army for assignment.

First Lt. Charles C. Gaines, Av. Sec., S. R. C., active duty at Chanute Field, Rantoul, Illinois.

Second Lt. Bethel Edrington, Av. Sec., S. R. C., active duty at Chanute Field, Rantoul, Illinois.

First Lt. Charles Monroe, Av. Sec., S. R. C., active duty at Garden City, Long Island, N. Y.

First Lt. Robert D. Newhall, Av. Sec., S. R. C., active duty at Portland, Ore.

Second Lt. J. P. W. Arnold, Av. Sec., S. R. C., active duty at Portland, Ore.

First Lt. Arthur N. Bobbitt, Medical Reserve Corps, Los Angeles, Calif., for duty as a Medical Member of Examining Board and Recruiting Officer for the Aviation Section, Signal Corps.

Appointments Announced by the Adjutant General

To be Captain, Av. Sec., S. R. C.: Harry Mack Horton, 2 West 57th St., New York, N. Y.; Reuben Hitchcock, 1871 E. 97th St., Cleveland, Ohio.

To be First Lieutenants, Av. Sec., S. R. C.: Ira Eugene Westheimer, Arthur W. Vanaman, Maple D. Shappell, Merrill Keith Riddick, Joseph R. Marriott, Lawrence C. Mann, Ray L. Makin, Harold A. Lorenz, Clarence Edgar Hyde, Beverly W. Holmes, William A. Frye, Cleveland Cobb, Cecil K. Braddick, Byron Ford Vandenburg.

To be Second Lieutenants, Av. Sec., S. R.C.: Magruder Dent, The Benedict, Washington D. C.; Ralph Edmund Trickle, Rantoul, Ill.; John Albert Schreiber, 1120 Forest Ave., Evanston, Ill.

To be Second Lieutenants, Av. Sec. Sig. Res. (Non-Flying): Steuart Lansing Pittman, Leavitt J. Bulkley.

To be Temporary Captains, Signal Corps, Regular Army

Joseph Boyarsky, Corpl., 35th Inf., Nogales, Ariz.; Donald W. Rowan, Corpl., 35th Inf., Nogales, Ariz.; Henry M. Jeffries, Corpl., 35th Inf., Nogales, Ariz.; Andrew B. Hawkins, Mess Sgt., 35th Inf., Nogales, Ariz.; Oscar E. Hembree, Sgt., 35th Inf., Nogales, Ariz.; Horace K. Mann, Sgt., 35thInf., Nogales, Ariz.; Everett E. Simmons, Sgt., 22d Inf., Ft. Niagara, N. Y.; Joseph C. Neff, 1st Sgt., 35th Inf., Nogales, Ariz.; Geo. A. Norris, Sgt., 35th Inf., Nogales, Ariz.; Robert P. Oldham, Sgt., 35th Inf., Nogales, Ariz.; Hans O. Rasmussen, Sgt., 22d Inf., Ft. Sill, Okla.; Frank Connell, Sgt., 35th Inf., Nogales, Ariz.; Robert A. Nelson, Sgt., 35th Inf., Nogales, Ariz.; Frank Ondrieck, Supply Sgt., 17th Inf., Ft. Oglethorpe, Ga.; Henry W. Mann., Sgt., 17th Inf., Ft. Oglethorpe, Ga.

To be Temporary First Lieutenants, Signal Corps, R. A.

Keeling G. Pulliam, Isaiah Davies, Kelly Field, San Antonio, Texas.



NEW HOME FOR DAYTON ENGINEERS

AN event of great interest to the engineers of the entire Miami Valley will be the dedication ceremony in connection with the opening of the new Engineers' Club of Dayton, which will take place on February 2.

The president, Colonel E. A. Deeds, is a member of the Aircraft Board, and is devoting his entire time to the war program. The list of vice-presidents include Mr. C. F. Kettering, Mr. Orville Wright, and Mr. Henry M. Waite, the city manager of Dayton.

Inception

Dayton's greatness is founded upon industries that Dayton's courage and genius created.

Dayton, the "City of a Thousand Factories," Dynamic Dayton, if you please has determined in her soul to replace guess work and idle dreams with exact knowledge and scientific research, thus creating for herself, a dominant place in the technical world. And so, in their wisdom, the generous desire of two of her prominent public-spirited engineers has been fully justified in this comfortable and commodious building.

The Club House and Its Equipment

Early in the inception of the Engineers' Club of Dayton, high ideals were laid for the future of the organization with an anticipated hope that some day these ideals would be reached.

Soon after the organization was consumated and its future success assured, attention was first directed toward the selection of a Club House to better carry on the work planned and which developed in the choice of the structure which so effectually met the needs of the club for the first two or three years after its organization. It soon developed, however, that the first home was rapidly becoming inadequate to meet the successful development of the social and educational advantage so much enjoyed by the rapidly increasing membership. It was then that the full need of a larger and more completely equipped building became apparent, and steps were taken for the realization of a long cherished hope that some day the club would become a power in the community for the further advancement of engineering and scientific research.

A building committee was formed and extensive plans immediately outlined for a new home so modern in its arrangement and equipment as to fully meet the ideals cherished by those men who constitute its membership.

In order to give a more intelligent understanding of the completeness of the undertaking, as well as to point out the thoroughness with which every detail has been executed, attention is directed to the following brief description of the new house and its equipment.

The Building

The building which is beautifully located at the southeast corner of Monument avenue and Jefferson street, facing the river, is conveniently located near the center of the city, making it easily accessible for all those who take advantage of its opportunities.

The classical detail has been followed in the architectural design of the building, giving a refined dignity consistent with the high class character of the entire structure.

It is three stories high, facing one hundred and fifty feet on Monument avenue and one hundred and twenty-five feet on Jefferson street.

The exterior is built of Bedford, Indiana, limestone and soft-toned gray buff brick laid in Flemish pattern, with wide white mortar joints. The design is a strong Georgian effect giving a dignity and refinement well adapted for an engineering building.

The main entrance fronts on Monument avenue, although there is also an entrance on Jefferson street as well as a porte cochere entrance on the east side.

The impression first received on entering the lobby, as well as throughout the entire interior, is that of simple, quiet, hominess, due to the English treatment given most of the rooms.

Directly south of the lobby entrance is a broad English stair leading to the spacious second floor lobby, treated in Caen stone effects, with ornamented ceiling and frieze. To the right of entering are located the Secretary's office and telephone booths, and beyond is a large billiard and game room which is provided with a large stone fireplace, English ceiling and wainscoting and cork floor.

To the left of the lobby is a broad visiting gallery, at the east end of which is the porte cochere entrance. Entrances from the gallery also open to the Sunken Garden to the south, and the large ladies' reception room carried out in the beautiful Adam period of refined detail. A ladies' retiring or dressing room adjoins the reception room, while check and toilet rooms are conveniently located.

South of the lobby and down fine marble steps is the dining room foyer, with checking facilities, and entrance to the Sunken Garden to the east and Jefferson street to the west.

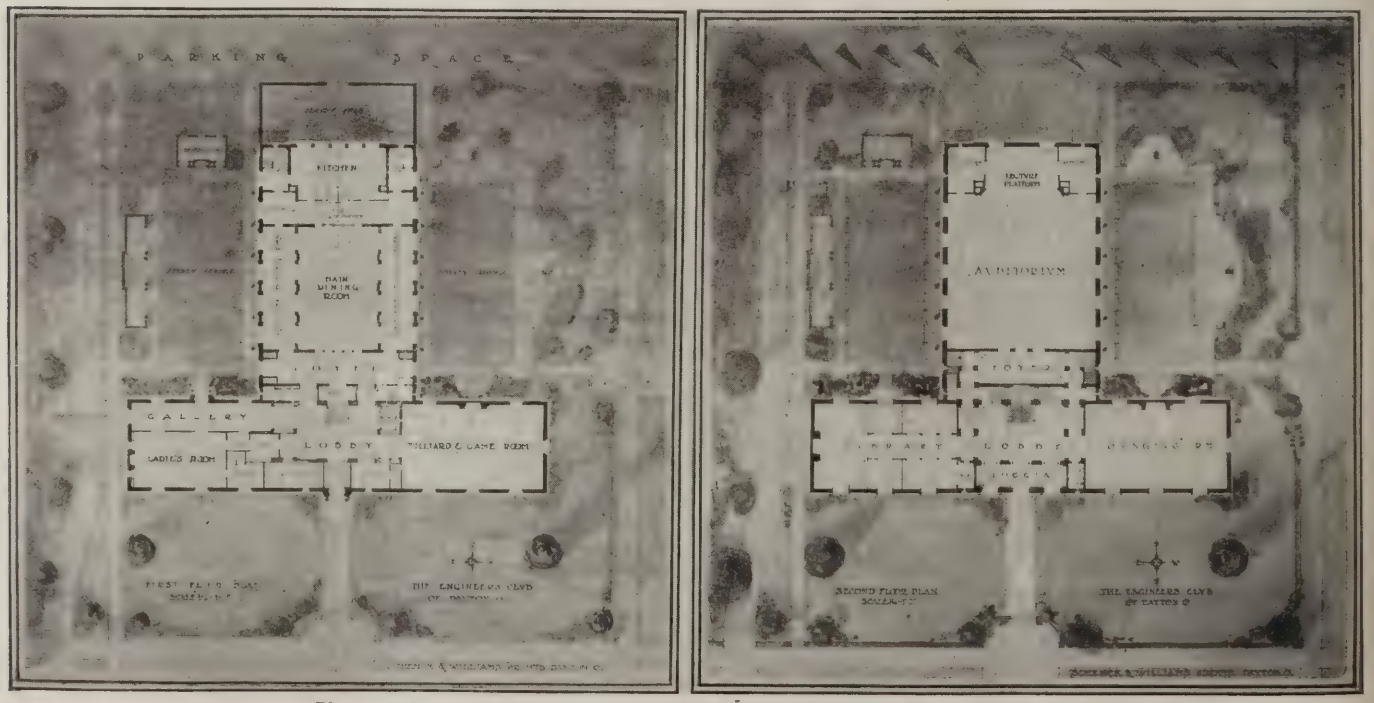
Directly south of this foyer is the main dining room, off of which open eight private dining rooms, all of which may be thrown together with the main room making a large room for banquet purposes. South of the dining room is a spotless white serving room and kitchen provided with the latest improved equipment for efficiently handling the service of the Club.

Furnishings

The entire building is attractively decorated and the luxurious furniture is all that could be desired. The floors are covered with carpets, cork or marble, each material being used where the best results will be obtained.

The beautiful lounging room, located directly over the billiard room is 30 ft. by 50 ft., with a large stone fireplace on the south side, high English wainscoting and heavy wood beamed ceiling. All kept in soft quiet coloring, making a restful atmosphere.

The whole building is provided with large steel casement windows affording ample light at all times.



Plans of the ground and second floor of the new Engineers' Club of Dayton.

(*Continued from page* 784)

Huge Warplanes Most Important Development of the Year

The developing of huge warplanes has been the most important development of the year. The importance of large machines was overlooked by all the countries, excepting Italy, until this year. True British, French and American manufacturers developed large warplanes at the same time as the Italians developed their Capronis, but the development was not due to official encouragement, as was the case in Italy.

The Aero Club of America, which has urged the building of large machines and has pointed to their military value for over two years, has passed the following resolution urging the organization of an Emergency Air Fleet of large machines:

"Whereas, the greatest difficulty of the Allies has been to move their forces fast enough to meet unexpected German attacks on weak points of the Allies' lines, and to overcome the advantage which the Germans have of being able to transport large bodies of troops, ammunition, and supplies from one part to another by interior lines; and

"Whereas, it is evident that powerful warplanes afford the needed combination of power and mobility in a higher degree than do any other appliances, and that the recent occupation of the Baltic Islands by Germans and the Italian reverses in the province of Venezia could have been prevented if the Allies had been able to send a sufficient number of torpedoplanes and bomb-dropping aeroplanes to assist the Russians and Italians at the first evidence of danger; and

"Whereas, it is generally accepted by the recognized authorities on aeronautics that aeroplanes can easily be built which can fly across the Atlantic and thereby solve the problem of delivering large units of aeronautic power to England, France, Italy and Russia, without dependence on ocean transportation, or interfering with it; and

"Whereas, there are in the United States unutilized manufacturing facilities and resources which could build thousands of powerful warplanes during the coming year without interfering with the present aeronautical program of the Army and Navy; and

"Whereas, these warplanes can conduct major aerial operations against the German fleet and U-boat bases, as well as against the German lines of communication and military industries and forces;

"Be It Resolved, that these facts be brought to the attention of the President, the Council of National Defense, the Secretary of War, the Secretary of the Navy, the Aircraft Production Board, and to the American public through the press, and that the coming Congress be urged to expand the present aeronautical program by appropriating not less than $1,000,000,000 for building an "Emergency Air Fleet" of huge warplanes, and also appropriate $1,000,000,000 to carry out a comprehensive aeronautic program of training aviators and building the tens of thousands of fighting, photography, artillery and contact patrol aeroplanes; dirigibles and balloons, which are needed to assure the Allies' supremacy in the air."

Creation of British Air Ministry Crowning Event of the Year

The crowning event of the year was the creation, in November, of the British Air Ministry—which established a separate Department of Aeronautics with an Air Minister at its head. Lord Rothermere, brother of Lord Northcliffe, was appointed Air Minister on November 28th and his position corresponds in rank and responsibility and in status to the First Lord of the Admiralty and the Secretary of State for War—the British equivalent of our Secretaries of the Navy and of War.



Building fuselages in a large aircraft factory which is turning out large numbers of aeroplanes for the government. (Photos passed by Censor.)

THE WIND CHANNEL—ITS DESIGN AND USE

By J. R. PANNELL*

Summary

Discussion of the value of model experiments
Description of wind channels other than those at the N.P.L.
Description of two first and subsequent channels at the N.P.L., with an account of the airscrew balance. Chief precautions to be observed in erecting the main balance and the methods by which its accuracy is checked.
Measurement of wind velocity.
Comparison between the channels, with some figures of the cost of the newer ones.
Discussion on the various methods of supporting models and a description of the methods in use for evaluating the resistance of the supports.
Stability of aircraft. Short account of the investigations which have been carried out, with an explanation of the system of axes used Description of the methods of carrying out the various wind channel tests.
Remarks on the corrections to be applied for change of scale and speed.
Conclusion.

It has long been realized that experiments in the laboratory on small models affords in certain cases a means of obtaining, cheaply and rapidly, information on the behavior of the actual structure under the conditions in which it is to be used. This plan has been adopted in many branches of science, and in none to a larger extent than in naval and aeronautical architecture. The problems to be investigated are usually those connected with the motion of bodies through a fluid, but if we accept the principle of relative motion we have an alternative method open to us for our model experiments. We may, if we wish, reverse the conditions and set the fluid in motion, the model remaining stationary. Generally speaking, one plan has been adopted in naval architecture and the other in aeronautics. In the former case models are towed through water in a ship tank, while in the latter they are placed in a tube through which air is passed. One difficulty in the case of the moving fluid is to estimate the velocity, and, mainly for this reason, a certain amount of experimental work has been carried out in air by moving the body on a whirling arm. This plan was invaluable in providing a standard anemometer calibration. but this done, there is only an extremely small amount of work which cannot be carried out more satisfactorily in the wind channel. The stationary model offers many advantages, particularly in connection with measurements of the forces acting upon it, and the writer is of the opinion that the method might be applied with advantage in experiments on ship models to a greater extent than has hitherto been the case.

The application of model results to the actual structure is often a matter of considerable difficulty, but as the amount of information obtained in aeronautics increases it appears probable that the change of the coefficients in passing from model to full scale, which is small in the majority of cases, will soon be known with considerable accuracy. Under these circumstances the value of model experiments becomes very high, and it appears that the performance of an aeroplane can be predicted by this means with considerable accuracy.

It must be clearly understood, however, that the value of model experiments is entirely dependent on their accuracy. Changes in parts of an aeroplane may often cause appreciable differences in the performance, though the parts themselves may be so small as to be difficult of reproduction at all on a 1/12th scale model. An instance of this may be cited. It has been stated that in a certain type of aeroplane the substitution of streamline for circular wires caused an increase of 10 miles per hour in the speed, yet it is quite certain that only the highest experimental accuracy would enable the difference to be measured on a 1/12th scale model.

The present paper is concerned with the methods which are now in use in carrying out experiments in a wind channel.

Again, some experiments were carried out on a 1/25th scale model of a large biplane in order to determine, among other things, the angle at which the tail plane of the machine should be set and the position of the rudder hinge, in order that the rudder should be just stable. The model experiments determined the required angle of the tail plane, and showed that the rudder would be neutral if the hinge were moved forward a few thousandths of an inch. The determination of the latter quantity represented the extreme limit of accuracy, but it was found in the actual machine that the rudder was rendered stable by a forward movement of the hinge of an inch or so. Moreover, this machine was one of the earliest of its size, and it was feared that an error in the setting of the tail plane (which was based on the results of the model experiment) might give rise to forces on the machine greater than those which could be exerted by the controls. The machine, however, carried out its trials without accident, and its prototype is to-day one of the most successful British bombers. If it be concluded that the model experiments prevented accident to only *one* machine, the saving in mere money was sufficient to carry on the work of the entire Aeronautical Department of the National Physical Laboratory for many months.

The present paper deals with some of the methods and apparatus which have been employed in carrying out experiments in a wind channel.

When the author was invited by the Secretary of the Society to prepare a paper on "The Wind Channel"' he was at once impressed by the fact that such a general title could only be justified if a description of all the channels in which satisfactory experiments had been carried out was included. An attempt has therefore been made to describe briefly the more important channels of the world, as far as they are known to the writer, the greatest attention being paid to those in which results of obvious value have been obtained. The author's actual experience is, however, limited to the channels at the National Physical Laboratary, and the paper must be regarded as mainly a description of that type. It is difficult to avoid bias in favor of apparatus with which one is familiar, but the writer believes that this type of low resistance channel, in which the air is drawn from a large reservoir, is unequalled for accuracy and rapidity of operation. This view was supported by Lieutenant J. C. Hunsaker, of the United States Navy who, after a tour of the principal aerodynamical laboratories of the world, recommended the erection at the Massachusetts Institute of Technology at Boston, U. S. A.,* of a four-foot channel which in all the essential details is an exact copy of those at the N.P.L.

It may be remarked that considerable progress has been made since the apparatus and methods described in this paper were in use, but the exigencies of the present situation forbid the publication of any further details.

It will be convenient to group the channels under the countries to which they belong, and we may commence with the one which perhaps did more than any other in the early days of aviation towards the development of practical types of airships and aeroplanes.

FRANCE

A small wind channel was erected at the military establishment at Chalais-Meudon, which was in charge of Colonel Renard, as long ago as 1877, and constitutes the earliest channel known to the writer. It was 13 feet long and had a diameter of 2½ feet. A considerable amount of work appears to have been carried out on models of airships, but the results were regarded as confidential and were not published.

A very extensive laboratory was founded in 1911 by M. Deutsch de la Meurthe at St. Cyr. It includes laboratories, workshops, administration building, several wind channels, and an open-air track upon which runs an electrically-driven carriage. Experiments are made on this carriage with full-size aeroplane wings, and it is by this work that the St. Cyr Laboratory is most generally known.

No details of the channels are available, but the form is understood to be circular with the balance situated underneath the channel.

A very large amount of experimenetal work has been carried out in the laboratory of Eiffel, situated in the Champ de Mars, Paris. The laboratory was constructed about 1910, and contained a circular channel nearly 5 feet in diameter, in which experiments were made in continuation of those with falling plates on the Eiffel Tower. The characteristic feature of the channel is that the experiments are made in an hermetically sealed room, in which the pressure is equal to the static pressure in the channel. The air stream crosses this room without any solid boundary, and it is stated that larger models can be used than is the case if the stream is confined within rigid boundaries, no sensible eddies being set up. The length of the chamber is 12 feet, and a conical receiver projects slightly into it on the outlet side.

A balance is provided for measurement of lift, drag, and moment, the observers sitting on a platform above the free stream.

A 65-h.p. motor was used, and a speed of 65 feet per sec. attained. Several anemometers of the pressure head type were employed, and compared with the drop of pressure in the closed chamber. The velocity calculated from this pressure difference by the formula

$$V^2 = 2gh$$

was 1½% higher than that given by the pitot tube. A new laboratory was opened in 1912 at Auteuil. The channel is constructed on exactly the same principle as the earlier one, but the diameter has been increased to 6½ feet. The air is led into the test chamber by a reducing cone whose diameter changes from 13 feet to 6½ feet in a length of 11 feet. The stream leaves the test chamber by a bell-mouthed opening and passes to the "discharger," which is a cone increasing from a diameter of 6½ feet to 11 feet (which is the diameter of the fan) in a length of 30 feet. This design is stated to be very efficient, as the air reaches the fan at a low velocity and at a pressure little above that of the hall into which it is delivered. A 50-h.p. motor is provided, and a maximum speed of 100 feet per sec. is attained.

Experiments have been carried out in these channels covering a very wide range of subjects, including the determination of forces and moments on aerofoils, complete models, and bodies, pressure plotting experiments, and tests on series of airscrews.

The convenience of an arrangement which enables the observers to be placed in the sealed test chamber is no doubt great, but it is open to question whether the accuracy of results obtained in this free current is so high as those obtained by the more generally accepted methods.

It has been shown that an error of 0.2° in the assumed wind direction would cause an error of 6% in the value of the drag of an aeroplane model.

ITALY

The principal aerodynamic laboratory in Italy is that of the Brigata Specialisti. It is situated near Rome, and is under the charge of Major Crocco. The apparatus includes a wind channel in which very elaborate precautions were taken to secure uniformity of the flow. The air was forced by the fan into a closed chamber, where the velocity was reduced and the pulsations partly damped out. It then passed to another chamber larger than the first, from which it entered the experimenetal channel, which was 2.5 feet square. Several layers of gauze were introduced, and the flow was stated to be satisfactorily uniform to within a short distance of the wall. The model was supported on the balance just outside the end of this channel, so that at the section of the stream at which the experiments were made there was no solid boundary.

Several balances were in use that provided for the most accurate measurements being supported on the surface of a vessel of water. The principal part of the wind force was balanced by weights attached to a cord passing over a pulley. Records of the movement of the balance were obtained by means of additional apparatus, in which electric sparks were passed through specially-prepared paper.

In 1912 the laboratory was reorganized under the title To Stabilimento di esperianze e costruzione Aeronautiche del Genio, and a new wind channel of an entirely different type was erected. This channel is 6½ feet square and 22 feet long, the air current being produced by a Sirocco (centrifugal) fan, belt-driven from a 30-h.p. electric motor. The balance is placed in a sealed test chamber, there being a gap of about 3¼ feet at the position at which the experiments are made. The method of test is thus similar to that of Eiffel, except that the length of the "free" stream in which the measurements are made is much less. The test-room is divided into two parts, the upper of which contains the balance and its observer, while in the lower is placed the manometer and various other instruments. The speed of the air current can be regulated from this chamber by opening or closing shutters on the intake side of the fan.

Two anemometers are used, one situated upstream of the test section and another placed near the outlet of the channel. The uniformity of the flow is improved by the introduction, near the fan, of a layer of gauze and a honeycomb, and it is stated that over a period of one or two minutes (the time required for an observation) the flow can be kept sufficiently steady. The range of velocity available is from about 7 feet per sec. to 52 feet per sec. Experimental work of considerable value had been carried out in this laboratory till the year 1914, but information as to the results obtained since that date is not at present available.

GERMANY

The principal Aerodynamie Laboratory in Germany was that at Göttingen, of which Prandtl was in charge. This channel is of the enclosed type, in which the air circulates continuously round an approximately rectangular path. The test section of the channel is 6½ feet square, but if high speeds are required an octagonal liner can be fitted, reducing the diameter to about 3.3 feet. Guide blades are provided at the corners and a honeycomb and gauze screens are introduced to secure uniformity in the flow. To this end also the walls of the honeycomb are made double, so that any cell can be partly closed

*Lecture delivered before the Aeronautical Society of Great Britain.

*Described in the Smithsonian Miscl. C., Vol. 62.

by bending one of the walls across it. The gauze is also rendered finer where necessary by painting. The arrangements for the measurement of forces are unique, separate balances being provided for lift and drag, a total of four being required for the complete investigation of forces and moments. The model is suspended on wires and is restrained in a horizontal plane by two wires at an angle of 120° to each other. One of these wires is fastened to the wall of the channel, while the other passes through it and is attached to the drag balance. The drag is calculated from the increase in tension of this wire when the air current is started.

Four supporting wires are brought to a light rod, placed along the wind direction, from which the model is suspended, but it appears to the writer preferable to attach the wires to the model directly, as in the case of a low resistance form the flow has been found to be very sensitive to small obstructions. This modification may perhaps have been subsequently introduced. Each pair of wires is taken to a balance above the channel for measurement of lift, and the fourth balance is used in obtaining rolling moments.

The velocity is measured by a kind of pitot tube with an inclined tube alcohol manometer, and an automatic regulator is provided to maintain a constant speed. This regulator consists of two bell jars, hung, with their lower ends under water, from a balanced arm. One jar is connected to the channel immediately in front of and the other immediately behind the airscrew, a pressure difference proportional to the square of the wind speed being thus obtained. The speed is set to the desired value by the regulating resistances and a weight on the regulator balance set to a position marked upon it for the required speed. A change of speed now causes the balance arm to move over to one stop operating a resistance in the field circuit of the motor. The stops are also mounted on a swinging arm whose motion is damped by a vane moving in a fluid. This latter device reduced "hunting" due to over-regulation.

An electric motor drives the fan, a maximum speed of 33 feet per sec. being attained in the 6½ feet channel and 55 feet per sec. when the section is reduced to 33 feet.

For several years before the war the work carried out in this channel dealt mainly with the resistance of streamline bodies, including measurements of pressure distribution. Experiments have also been made on the resistance of spheres, and to a limited extent on aeroplane models, though the latter branch of study has doubtless been extended recently.

AMERICA

A wind channel was erected in an Aerodynamical Laboratory at Washington in 1901 by Mathilath. The section was 6 feet square and the length 40 feet. The current was produced by a fan 5 feet in diameter driven by a 12-h.p. electric motor, a maximum speed of 40 feet per sec. being attained.

It was provided with a balance for measurement of lift and drag, and with a torsion balance.

This channel was used by Zahm in 1904 for his experiments on the skin friction of flat boards. The method adopted was to suspend the boards by wires from the roof of the laboratory and observe their displacement under the wind forces.

No complete description of this channel has been available, but it appears to be of a satisfactory type. As far as the writer is aware, however, no important work has been carried out since that of Zahm.

A channel of the N.P.L. pattern has recently been erected in the Massachusetts Institute of Technology.

A large channel is installed at the Washington Navy Yard. It is of the closed circuit type, the dimensions of the working section being 8 feet square and 33 feet long. It is fitted with a honeycomb at the entrance to the working section, some of the cells being closed to improve the uniformity of the flow, which is said to be within 2% of the mean. The balance and motor control board are situated above the channel, the balance being similar to that used by Eiffel.

The current is produced by a 500-h.p. electro motor, driving a centrifugal fan; a maximum speed of 75 m.p.h. can be attained, but considerable heating of the air takes place at this speed and tests are usually carried out at 40 m.p.h. The velocity is measured by pressure tube anemometers, which have been calibrated against the N.P.L. standard.

RUSSIA

The principal experiments in aerodynamics which have been made in Russia are those conducted at the Institute at Kontchino, near Moscow,* under the superintendence of Riabonchinsky. The equipment includes a straight channel of circular section 4 feet in diameter and about 48 feet long. The air is drawn through the channel by a fan, which is belt-driven from an electro motor, and is returned through the building in which the channel is placed. A maximum speed of about 20 feet per sec. is attained, and a balance, whose axis is horizontal, is provided for force measurements.

*Kontchino Bulletin Fase 1 1906.

Experiments in this channel have, on the whole, been of scientific rather than of an engineering character, and include observations on the resistance of spheres, autorotation of plates, resistance of square plates, etc. The reports issued include several relating to propellers.

GREAT BRITAIN

The principal aeronautical laboratory for model experiments in this country is at the National Physical Laboratory, and comprises five wind channels, enclosed whirling arm, small water channel, and two wind towers. A 4 feet air channel is in use at the Royal Aircraft Factory in connection with the full-scale experimental work, which differs from those at the N.P.L., in that no distributor is used. The channel is located in a large airship shed, and no disturbance is caused at the intake due to the eddies from the airscrew. The same modification is applied in the channel at the Royal Naval Air Station at Kingsworth, which has a section 6 feet (horizontal) by 4 feet. In this case a four-bladed airscrew driven by a petrol motor is placed in the open air and the current is drawn through the channel from an airship shed. A speed of 100 miles per hour is attained.

A small wind channel was installed at the East London College in 1911, and is still in use for certain experiments. This has been replaced by a 4 foot channel, which is a copy of the National Physical Laboratory channels except that it is constructed of iron. The writer is indebted to Mr. Norman Piercy, who is in charge of the channel, for the following particulars. The balance differs from those at the N.P.L., the axis being horizontal, and includes one notably novel feature. Considerable trouble had been experienced with the pivot upon which the balance of the earlier channel was supported, and at the suggestion of Professor Macgregor Morris this pivot was discarded in favor of a metal diaphragm whose plane is vertical, and to which the balance is rigidly attached. The diaphragm is bolted between two stout metal rings, the motion of the balance being resisted by the flexual rigidity of the diaphragm.

With the diaphragm at present in use the limit of sensitivity is about 1/6000th of a pound. Greater sensitivity could be obtained by the use of a thinner diaphragm, but one objection to the method appears to be that the sensitivity cannot be readily changed in passing from one test to another.

The angle of incidence is varied by rotating the balance in a bearing the outer part of which constitutes the attachment to the diaphargm. The lift forces are measured by weights hung on the beam of the balance; the drag forces are transmitted by a horizontal bell crank to another bell crank whose plane is vertical, and upon the horizontal limb of which the measuring weights are hung.

The maximum velocity which can be attained at present is 50 feet per sec., but sufficient power is provided to attain 90 feet per sec. when the driving arrangements have been modified.

There are many other channels in use in this country, but the author believes that the more important of them are copied from those at the N.P.L.

The Channels of the National Physical Laboratory

The first N.P.L. air channel was constructed in 1902. It was designed by Dr. T. E. Stanton, F. R. S., and used by him for the experiments on the air resistance of plane surfaces. This channel consisted of a vertical tube 2 feet in diameter, through which the air could be drawn downwards by a fan placed at its lower extremity. The air was delivered into the large engineering shop so that practically still air was continuously supplied at the intake of the channel. It is therefore not surprising that the steadiness of the flow was comparable with that of the newer channels. A balance was provided for measurement of forces along the wind only.

For measurement of velocity Dr. Stanton devised a pitot and static head, of which the present laboratory standard is the outcome; the only essential difference is that, for convenience, the tubes are now concentric, instead of some two inches apart, as in the original form. Much useful work was carried out in this channel, and it is still in service at the present time.

The Advisory Committee for Aeronautics was formed in 1909, and an extensive programme of work was laid down. The need of additional apparatus was at once felt, and it was decided to erect a new channel. This channel had its axis horizontal, and is shown diagrammatically in Fig. 1. The total length was 20 feet and the working channel, 4 feet square, was enclosed in a return channel 8 feet square. The air current was set up by a 6 foot Sirocco fan, driven by a belt from an electro motor, which drew the air through the working portion of the channel and delivered it to the return channel. Guide blades were provided at the fan outlet to correct the rotary motion of the air, and layers of wire gauze were introduced at the inlet to the test channel in order to improve the uniformity of the flow across a section. The velocity was measured by a pitot tube and Chattock tilting manometer, and reached a maximum value of 30 feet per sec.

The balance was constructed in such a manner that simultaneous observations of lift and drag could be taken. The axis of the balance was horizontal, and for measurements of lift turned in ball bearings about a horizontal axis normal to its length. These bearings were carried in a fitting suspended on fine steel wires, allowing rotation of the balance through a small angle about a vertical axis for measurements of drag. The latter motion was transmitted to a right-angled bell crank whose plane was normal to that of the main balance arm. The horizontal limb of this bell crank constituted the drag beam upon which were placed weights to balance the wind forces. An oil dash-pot was provided which damped the oscillations of the two beams. One observer observed the reading of the drag beam and another regulated the speed of the air current and observed the reading of the lift beam.

This channel was in use till the year 1912, and the whole of the experiments carried out up to that date were made in it or in the 2 foot vertical channel. The 4 foot channel was not, however, entirely satisfactory, the flow being too unsteady to allow experiments to be carried out to the high order of accuracy which was desired. This result was mainly due to two causes; in the first place the fan was of the centrifugal type which is now known to be unsuitable for this purpose. There was found to be large pulsations in the pressure, a feature which appears to be common to fans of this kind. The second cause, which was of less importance, was that the air was returned to the intake of the channel in a disturbed condition.

It was accordingly decided to undertake a complete investigation into the conditions which affect the uniformity of the flow.

The design of the N.P.L. channels in their present form was based on these model experiments, of which an account is given in the 1912-13 Report of the Advisory Committee for Aeronautics. The success of the experiments may be judged from the fact that the latest of these channels was made almost an exact copy of the first, the only modifications being of minor importance, which were suggested by experience as likely to facilitate the taking of observations or to improve their accuracy. The criterion by which the merits of the various arrangements was judged was the nature of the variations of pressure difference in a pitot and static tube of the standard N.P.L. pattern. The pressure was recorded by a special form of photographic gauge which was constructed for these experiments.

The model experiments were carried out with a channel 6 inches square, and this model was finally placed in a scale model of a bay of the engineering laboratory in which it was proposed to locate the actual channel.

A very exhaustive series of experiments was made with these models, and the following conclusions were finally arrived at:—(1) The air current should be produced by an airscrew of low pitch. (2) The air leaving the fan should pass into a distributor slightly larger than the fan and from three to four diameters long. The air should escape from the distributor through tubes of appreciable length actually about 1.2 inches in the 4 foot channels), which should distribute the air over as large an area as possible in constant quantity per unit area. (3) The smallest building in which such a channel may be housed to give satisfactorily steady flow is one whose dimensions are 6 x 6 x 15 channel diameters.

(To be continued.)

To be Second Lieutenants, Signal Reserve

George Wallace Hance, 129 Hazelwood Ave., Detroit, Mich.; Howard Palmer Saffiord, 1933 Park Rd., N. W., Washington, D. C.; Alden Leonard Hart, 1914 Grand Ave., Milwaukee, Wis.; Alessio Azzopardi, Ft. Leavenworth, Kan.; Noble Meek McKay, 2010 W. 7th St., Des Moines, Ia.; Albert A. Kaufman, 540 West 143d St., New York, N. Y.; Daniel H. Woodward, 79 W. 5th St., Atlanta, Ga.

Serbian War Mission to the United States Reaches Washington

The Serbian war mission arrived in Washington recently.

Following is the personnel of the mission:

Dr. Milenko Vesnitch, chief of the mission. Author; member of the French Institute; former professor at the University of Belgrade; Serbian minister at Paris.

Dr. Sima Lozanith, former professor of chemistry at the University of Belgrade; president of the Agricultural Co-operative Societies; former minister of agriculture and of foreign affairs; former Serbian minister in London.

Gen. Michailo Rachitch, commanded an army corps at Adrianople in the second Balkan War; representative of Serbian general headquarters at French general headquarters during the present war.

Lieut. Col. Michailo Nenadovitch, military attache to the Serbian Legation in Switzerland.

Capt. Milan Yovitchitch.

Mr. Vladislav Martinatz, attache to the Serbian Legation in Paris.

THE GERMAN AGO FIGHTING BIPLANE

THE British Air Ministry has collected a number of enemy aeroplanes, aeroplane parts and engines at a London depot and have granted facilities to aeroplane designers and representatives of responsible concerns to view this collection. They are arranged to show every constructional detail of the different machines. For the purpose for which the collection is intended, the machines and parts are most admirably arranged. Thus, in the case of complete machines, these are shown with one side stripped, up to the centre line of the fuselage; the other side is left uncovered. In this way it is possible to obtain on the one side an impression of the general arrangement of the machine, while, by merely walking over to the other side, one can inspect, at leisure, every spar, strut, wire and fitting. Great care and foresight has been shown, also, in the manner in which various parts, such as spars, etc., have been cut through in places, to allow of inspecting sections and internal construction. In this manner there are practically no component parts of which the general design and detail construction are not instantly clear from a very brief inspection. We do not propose to give, in this issue, a complete list of the exhibits, since, in any case, these change from time to time, but we hope later on to be able to publish sketches annd descriptions of other machines.

For the present we will confine ourselves to dealing with one captured enemy aeroplane—the Ago—which, thanks to the courtesy of the Air Board officials, representatives of *Flight* (to whom we are indebted for the accompanying description) have had the opportunity of examining in detail.

The first impression one receives on being suddenly confronted with the captured Ago biplane is apt to be one in which surprise mingles with curiosity. As regards its general lines, the Ago is of a striking unusual appearance, mainly, no doubt, due to the fact that its wings are tapered very pronouncedly from root to tip. This is very unusual in any modern, and when it is suddenly met with in a German machine of comparative recent date —from various marks on the machine one gathers the impression that it was built certainly no longer ago than the first months of 1917—the question that first comes to mind is naturally enough related to the ***raison d'etre*** of this unusual design.

In the first place, it is obvious that whatever it was the designer was aiming at, he was prepared to go to considerable trouble to obtain it, since the construction of such tapered wings as those of this Ago are not by any means an attractive proposition commercially, entailing, as it does, the seperate construction of half the ribs, no two of which are alike from root to tip in one wing. Also as the spars converge to a point at the tip, they intersect the ribs at varying distances from root to tip, which again means extra work in manufacture. As for the spars themselves, they also taper from root to tip again more trouble and expense.

What, then, are the reasons which have led a designer to sacrifice so much from a manufacturing point of view, in order to obtain this end? A walk round the machine soon furnishes the reply to the question. When standing in front of the machine one is at once struck by the peculiar bracing of the front spar. Instead of the usual interplane strut there is on the Ago only a single solid wire running from the front lower spar to the front top spar, while no lift or landing cables of any sort are employed between the two front spars.

This feature, then, will probably be found to contain the solution of the peculiar design. By doing away with the front bracing, a much freer field of firing is obtained, and there can be little doubt that this was the object the which the designer was striving.

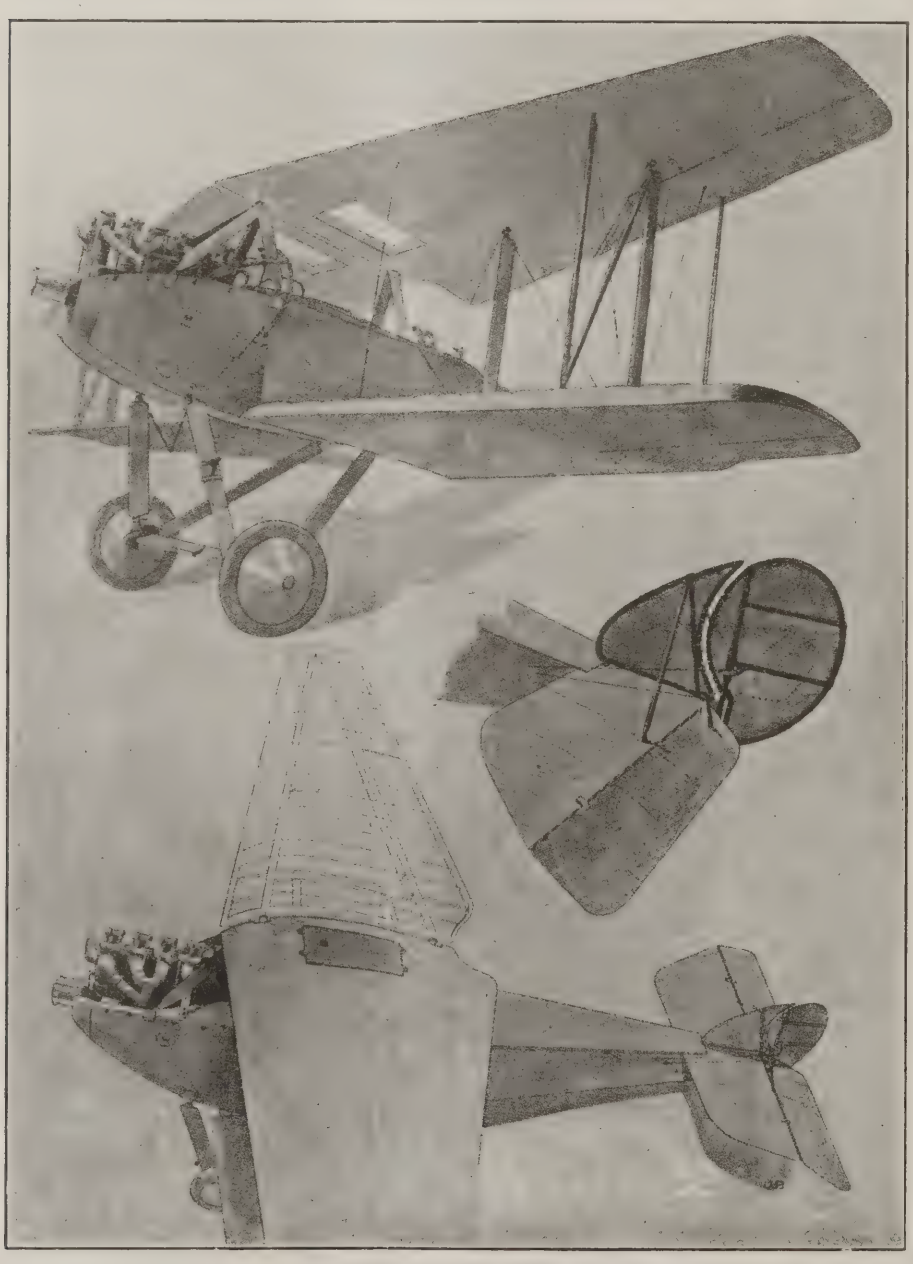
Owing to the backward slope of the leading edge of the planes, the outer inter-plane struts are farther back than they would be in a machine with straight wings, and also owing to the taper, closer together and therefore obstructing the field to a smaller extent. The narrower chord near the tip will result in a smaller travel of the centre of pressure, hence possibly the twist on the wings may become less, and the absence of front bracing be a less serious defect than one is inclined to imagine at first.

When we say absence of front bracing, this is not quite correct, since, as already indicated, a single solid wire runs from top to bottom front spar. As is well known, in biplanes, with top and bottom planes of the same area, and with the conventional spacing of gap about equal to chord, the top plane carries about 30 per cent. more load than the bottom one, or roughly, 4/4 and 3/7 respectively. By running a wire from the top to the bottom front spar, the latter is therefore made to carry a certain share of the top spar's load, thus relieving, to a certain extent, the enormous bending moment that must be present on a comparatively heavily loaded machine, whose front spars have a distance of some 13 ft. 6 in. between supports.

So much for the general design of the Ago. As regards the construction there is much detail work that is interesting and unusual. The fuselage which is, as in the majority of German aeroplanes, of very roomy proportions, as regards occupants' accommodation, is covered with fabric except the front around the engine, which is covered in the three-ply. The floor of the fuselage is of three-ply from the stern to the gunner's (rear) cockpit. From there to the nose the floor is three-ply, covered with aluminum. In section, the fuselage is rectangular, a light and comparatively flat structure forming a turtle back over the top of the main fuselage framework. This turtle back is built up as a seperate unit, and is easily detachable by means of a neat and very simply clip. In case of severe stresses being put on the fuselage, it is therefore an easy matter to detach the top covering and examine and adjust the internal bracing.

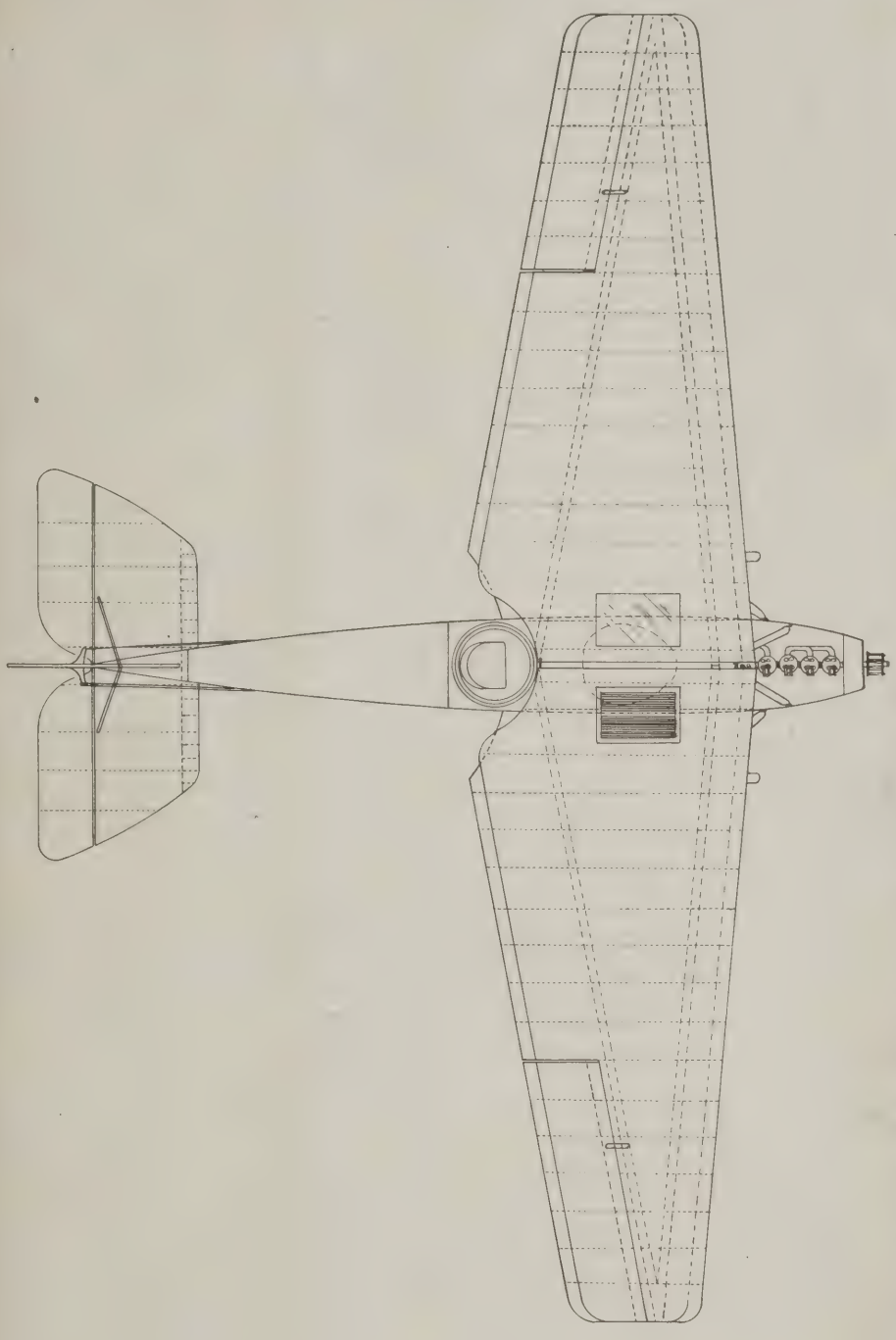
The four longerons, which are of square section, are pine, from the rear cockpit to the stern, while in front they are made of ash. The struts are in the form of steel tubes and the solid wire bracing is attached to the struts in the manner shown in one of the accompanying sketches. A small socket, apparently machined out of the solid steel bar, has holes drilled in its edges, through which the bracing wires pass. This socket is slipped over the end of the tube, which has small dents in its end to give more room for the loop of the wire, and the socket, with its strut, is secured to the longeron by a bolt passing through it, with the nut and a spring washer inside the socket, as shown in section in one of our sketches. Except for the fact that the longerons are pierced by two holes—the horizontal and vertical fuselage struts are staggered in relation to one another—close to one another, this arrangement appears to be very neat, and certainly takes up very little space.

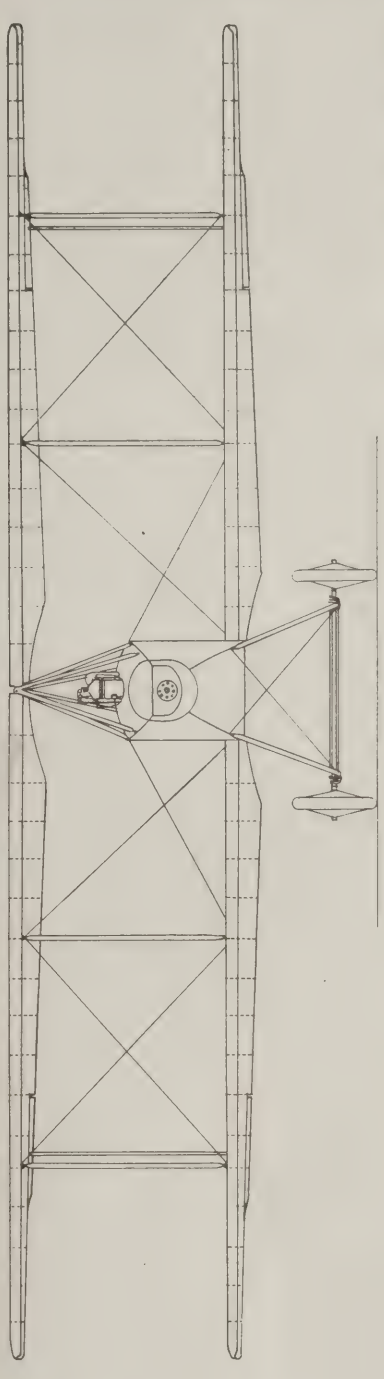
In front, the fuselage bracing is in the form of diagonal steel tubes, no wires being employed. The rear cockpit is occupied by the machine gunner, who is seated on a small seat built up of a framework of steel tubing, over which is stretched canvas. This seat is so hinged and sprung that immediately the gunner standsup the seat springs into a vertical position out of his way in case he wishes to do his shooting in a standing position. When horizontal, the seat is supported by a slanting steel tube, pivoted at its lower end

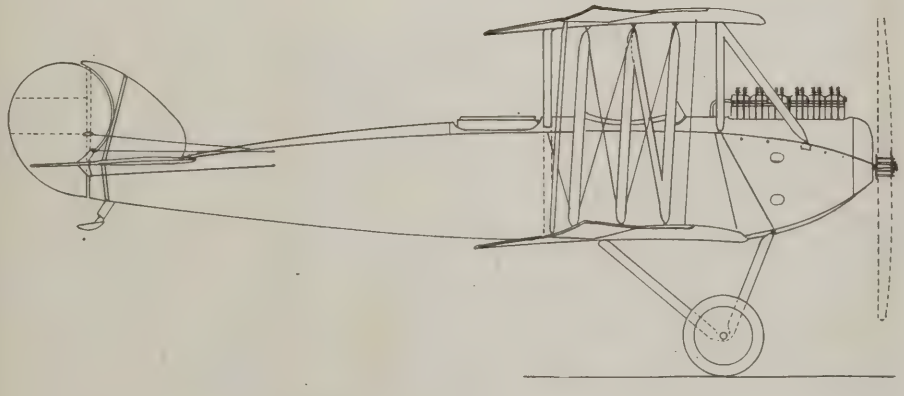


THE AGO BIPLANE.

Some general views. Top: Three-quarter front view. The openings in the top plane for the radiator and petrol service tank should be noted. Bottom: View from above, showing in diagrammatic form the construction of top plane. Inset: The tail planes.

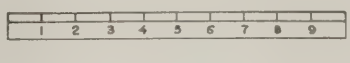






GERMAN AGO
1917 TYPE - 230 HP. BENZ
FIGHTING BIPLANE

Scale of feet



McLaughlin

to the floor, and having its upper end running in a steel guide, bolted to the under side of the seat. The principle will be better understood by reference to one of the accompanying sketches. The gun is mounted on a swiveling bracket, which, in turn, is supported on a rotatable gun ring of wood, forming, in effect, a turntable, by means of which the gun may be traversed in any desired direction. To prevent damaging the nose of the machine and the propeller, a stop is provided for the gun in the form of two small frames clipped to the rear legs of the cabane, which prevents the gun barrel from travelling too far inboard.

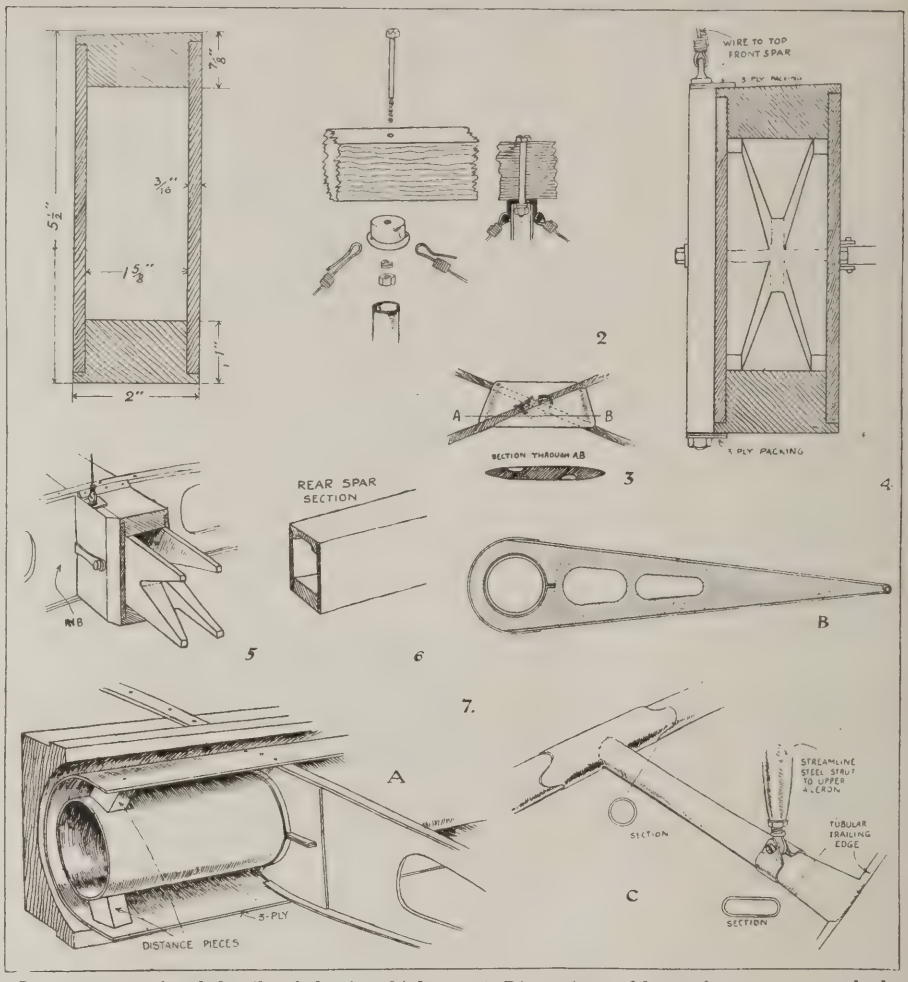
The pilot's seat, which is in the front cockpit, is placed on top of the main petrol tank resting on the floor of the fuselage. A service petrol tank is carried in and mounted flush with the top plane just to the left of the cabane. In the corresponding opening in the upper right hand wing, is carried the radiator, and in connection with these two it is interesting to note that the water and petrol is led through the right and left cabane legs respectively, thus saving a certain amount of piping, which would otherwise be exposed to the air.

The controls are, more or less, of the usual German type, with a vertical lever terminating at the top in a double handled grip, and mounted—via a universal joint—on a longitudinal rocking shaft, having at its other (rear) end crank levers for the attachment of the aileron cables. On the machine in question, no guns were mounted, but from the various fittings it appeared that there were at one time two machine guns mounted above the engine, and with the usual interrupting gear for clearing the propeller blades.

The large engine—a 230 h.p. Benz—is mounted on two longitudinal bearers, which are in turn supported from the fuselage by three direct supports—at the rear a sloping panel of ply-wood, in the middle by tubes sloping up from the junction of the rear panel to the lower longerons, and at the front by another panel of ply-wood, this a vertical one. In addition to these direct supports, the engine mounting is further braced by tubes to the upper longerons, and by diagonal tubes from top to bottom longerons. It has already been mentioned that the main gasoline tank is placed on the floor of the pilot's cockpit, while the gasoline service tank is mounted in an opening in the top plane. The oil tank, which is comparatively small, is carried under the engine housing on the right-hand side of the crank chamber. The propeller, which was not in place on the machine inspected, probably had a "spinner," or hemispherical nose-piece over the boss, as this would appear to go well with the nose of the fuselage, which is of rounded section at this point.

The main planes are, as already indicated, tapered from root to tip to a very marked extent, the trailing edge sloping considerably more than the leading edge. Successive ribs are of different depth, as well as chord, owing to the fact that the spars, in addition to their convergence, are of varying depth from root to tip. Whether, however, the ribs change progressively in such a manner that all are of actually the same section, but reduced geometrically, or whether they alter in shape as well as in size has not yet been ascertained, but judging from the way in which the spars taper it would appear that the end ribs are not of quite the same section as the inner ones.

Constructionally, the ribs are of the usual I section, with webs which appear to be made of poplar, and with flanges of ash. In between the spars the webs are lightened by cutting out in the usual way. The leading edge is of pine of U, or, more correctly speaking, of a rounded V section between ribs, but left solid where the ribs are attached to it.



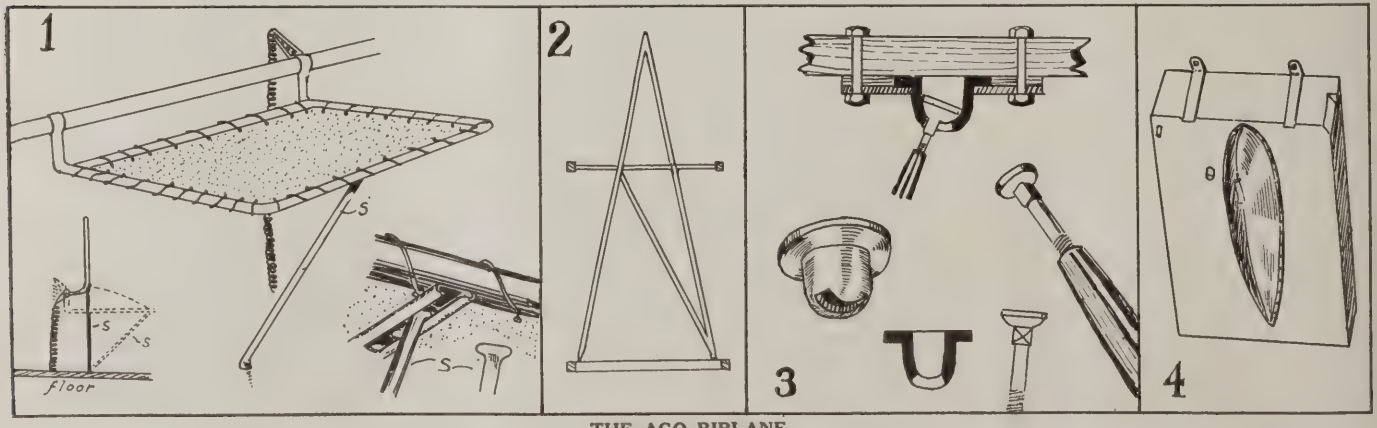
Some constructional details of the Ago biplane. 1. Dimensions of lower front spar near body. 2. Attachment of tubular struts to fuselage longerons. 3. The hardwood distance piece at the crossing of the internal wing-bracing cables. 4. Section of the lower front spar at the point of attachment of the interplane wire. 5. Perspective sketch of same joint. 6. Section of rear spar. 7. (A) construction of false spar and aileron leading edge; (B) An aileron rib (not to scale); (C) Aileron crank and attachment of inter-aileron strut.

The trailing edge is a thin lath about 1 in. wide by about 3/16 in. thick.

The main wing spars are of an interesting construction, and their section is shown in the accompanying sketches. The two flanges are glued to thin webs (about 5 mm.), the whole being wrapped in fabric. No tacks or screws are employed for securing the webs to the flanges, the glueing and wrapping being apparently relied upon to be sufficient for the purpose. At the points where occur the ribs a three-ply distance piece is glued into the hollow spar, but so narrow is this that in several places it was noticed that the tacks through the rib flanges had penetrated the spar flange, missed the three-ply distance piece, and had its end projecting inside the hollow of the spar. The rear spar, which was of slightly smaller dimensions than the front spar, was different in that its upper flange had been spindled out, otherwise the two spars were similar, also in that in both the top flange was not quite so thin as the bottom flange. The spars were constructed of what appeared tobe some kind of pine, possibly Dantzig.

Where the bolt, serving as an anchorage for the wire running to the top plane occurred, the spar was strengthened by a packing piece of peculiar form. This is shown in some of our sketches, which will, we hope, help to explain it. It will be seen that the saw cuts in the ends of this distance piece, leaves four tapering ends, which would have the effect of cantilever beams proportioned to carry an end load, the latter being considered as the lateral load on the spar at this point. Whether this, however, was in the designer's mind is doubtful. It is more probable that the shape of the piece is the result of an attempt at stiffening the

(*Continued on page* 800)



THE AGO BIPLANE.

1. The gunner's seat. 2. The rear cabane. 3. A cable attachment extensively employed. The cup-shaped socket is machined out of the solid and has a slot through which passes the shank of the turnbuckle. Three-ply packing is placed between the plate of the fitting and the base so as to make up the thickness of the socket. 4. The gasoline service tank lying on its end on the floor. When in place on the machine it is carried in the opening in the upper wing, to the left of the cabane.

FOREIGN NEWS

BELGIUM

German aviators bombed a Belgian hospital, according to the following official announcement:

"On the 3d, enemy aeroplanes dropped torpedoes and grenades on one of our hospitals in the region of Adinkerke."

FRANCE

The official report issued on December 29th includes the following statement on aerial activity:

"French aviators last night bombarded the railway stations at Mazieres-les-Metz and Thionville and German establishments in the vicinity of Vouzieres and Rethel."

The French official report issued on December 30th states that three German aeroplanes were brought down "by the fire of our special cannon."

According to an official announcement regarding operations on the Balkan front, issued on January 1st, French aviators dropped bombs of the railroad station at Mrzenial, three kilometres north of Ghivgheli.

The official report for January 4th details several French aerial victories:

"On January 3d French pilots brought down two German aeroplanes and a captive balloon. Six other machines fell within the German lines after aerial combats. On the same day French squadrons bombarded the factories at Rombach and railway stations at Metz-Sablons, Conflans and Arnaville. In the course of these expeditions projectiles weighing 7,500 kilograms (seven and one-half tons) were dropped."

Lieut. Raoul Lufbery of the Lafayette Escadrille had a narrow escape in a battle with four German aeroplanes. One of the Germans succeeded in puncturing the gasoline pipe on his aeroplane and as a consequence his motor stopped. Fortunately he was above his opponents and by means of a series of remarkable manoeuvers, during which he kept his machine gun in action all the time, was able to escape unhurt. Eleven bullets had hit his machine.

Contrary to general opinion, the Lafayette Escadrille has not been incorporated in the American Expeditionary Report, according to a special cable to the New York *Globe*.

A later report from Paris, however, states that negotiations have been begun by American army authorities for the transfer of members of the Lafayette Escadrille to the American Expeditionary Force. It is said that thirty-two experienced pilots will be the first to be transferred.

GERMANY

The official announcement of January 4th summarizes four days' aerial activity on the west front as follows:

"Since Tuesday the enemy has lost in aerial fighting and by gunfire twenty-three aeroplanes and two captive baloons."

GREAT BRITAIN

On December 29th a special aviation report was issued which describes more successful bombing raids:

"Our aeroplanes dropped over one hundred bombs on three enemy aerodromes north of Lille. Seven hostile machines, four of which fell inside our lines, were brought down by our aeroplanes; two others were driven down out of control, while four others were shot down by our guns, three falling within our lines. Three of our machines are missing.

The British official statement issued on December 31st reports the destruction of several German aeroplanes, as follows:

"Two hostile machines were brought down in our lines on Saturday. A third was brought down in the enemy's lines. Two other hostile machines were driven out of control. None of our aeroplanes are missing."

A special aviation report was issued on January 4th, as follows:

"Two hundred bombs were dropped Thursday on two hostile aerodromes, on the Ledeghem railway junction, on hutments in the neighborhood of the Houtholst Forest, and billets south of Lille.

"Six hostile aeroplanes were downed in air fighting and two others driven down out of control. Three of our machines are missing.

"During the night an additional 300 bombs were dropped on six enemy aerodromes, including the Gontrode aerodrome. Successful raids also were carried out in spite of the very bad weather against factories at Mezieres-les Metz, railway communications at Woippy and the railway junction at St. Privat, all of which are in the neighborhood of Metz. All of our machines returned."

A report on the operations on the Palestine front states that British aeroplanes bombed enemy troops and transports on the Nahalla road all day of the 28th of December with great effect.

A Zeppelin and a seaplane which was accompanying it have been wrecked in the North Sea, according to a Central News dispatch from Copenhagen, quoting advices received there from West Jutland.

The Zeppelin is said to have fallen in flames to the sea.

An official statement concerning the recent attack by British airmen on the city of Mannheim, issued December 29th, says:

"Further information about the Mannheim bombing raid on December 24th has been received. Two of our formations, totaling ten machines, crossed the line at a height of 9,000 feet between 10 and 10:15 o'clock in the morning and arrived over their objective almost simultaneously. In spite of a heavy and accurate anti-aircraft gun fire they dropped their bombs from a height of over 13,000 feet. Sixteen hundred and twelve pounds of bombs and 2,230 pounds of bombs were dropped by the respective groups.

"Four bursts were observed in the main station in Ludwigshafen and several munitions factories between Mundenheim and Rheingonnheim. The bursts were confirmed by photographs taken at the time.

"Two formations of enemy aeroplanes were encountered, totaling eleven machines, only five of which reached the height of our bombing machines. These did not attempt to attack at close range.

"The anti-aircraft defenses around Mannheim appeared to be strong, and brought down one of our machines, which was last seen descending under control. In addition, one of our observers was wounded, but reached home safely.

"Haze and mist added to the difficulties of the operations, some of the towns in Rhine Valley being completely covered."

Another flight from Italy to London was recently made by a Fiat-motored S. I. A. aeroplane. Although there was a contrary northwest wind, Captain Laureati, who piloted the flight, made the distance from Savoy to Hounslow, England, in seven hours and twenty-two minutes flying time at an average speed of 89 miles per hour. He started at 8:20 a. m. from Italy, and arrived in England at 2:55 p. m. The Alps were crossed at an altitude of 10,000 feet and the channel passage required but fifteen minutes.

ITALY

The official Italian statement issued on January 1st reports another German raid which caused practically no material damage, but resulted in killing of civilians.

"Last night enemy airmen attacked the aviation camp of Istrana and repeated their aggression against the inhabitants and open cities of Vicenza, Bassano, Castelfranco and Treviso, where bombs were dropped. Altogether we registered thirteen dead and forty-four wounded. The victims, for the most part, belonged to the civil population. The material damage was slight.

"Our air squadrons bombarded enemy aviation camps. Two hostile machines were brought down in the course of the day by French and British airmen."

The British official statement for January 1st, regarding operations on the Italian front, report considerable aerial activity.

"Some small raids have been successfully made across the Piave River by the British. The crossing of the river is difficult at this season of the year. British artillery and aircraft continue their efforts daily to destroy the enemy's batteries.

"In retaliation for December 26th, when they lost eleven machines, the enemy aircraft has been very active lately in bombing raids. The damage thus inflicted has been slight.

"All the Allied troops are confident of future success by their united efforts and look forward to the new year."

The Italian official statement for January 4th announces that British aviators accounted for one enemy machine and Italian aircraft downed another.

More bombing activity occurred on the Italian front, chronicled in the report issued January 2d. Anti-aircraft guns were used successfully according to the statement, which follows:

"Aviators and English batteries brought down three enemy aeroplanes. Two others fell as the result of aerial battles with Italian and French aviators. During the night enemy aviators dropped a few bombs on Mestre and Treviso. No damage was done nor were there any casualties. Enemy aviators also bombed Bassano, where one person was killed and five persons were wounded. Slight damage was done.

"Our squadrons bombed aviation camps at Lacomina and Aviano, causing extensive fires. Enemy moevments at the railway station of St. Sino de Livenza and enemy barracks have been bombed effectively by an Italian dirigible."

The official announcement issued January 3d reports further raids by enemy aviators directed against civilians and hospitals. The statement follows:

"On Tuesday night enemy airmen dropped bombs on Castelfranco Veneto, obtaining two direct hits on two hospitals. Eighteen patients were killed."

The Germans have conducted three successive night raids on Padua, resulting in the loss of many civilian lives and the damage of irreparable art treasures. The Sanot or the Basilica, where the body of St. Anthony of Padua is buried, lost its bronze doors and the sepulchre narrowly escaped damage. The bomb aimed at Donatello's famous equestrain statue destroyed the base but fortunately the statue had been removed. Paintings and frescoes by Titian in the Padua Cathedral have been damaged by the raiders. Several lives were lost, thirteen persons being killed on the first raid alone.

The official report follows:

"The enemy becomes more bitter in the bombardment of open cities. Last night his airmen returned for a third raid over Padua, dropping between 9 p. m. and 3 a. m. several scores of bombs. Fortunately, owing to arrangements by the authorities, the casualties were only five wounded, including one woman.

"The rich and artistic patrimony of the city, instead, suffered severely. The facade of the cathedral was blown down, and the Basilica of the Santo and the Municipal Museum were considerably damaged.

"Our machines last night bombarded very effectively the enemy's aviation camps at Aviano and La Comina, which they found lighted up, awaiting the return of their machines. In the night seaplane squadrons bombarded respectively with excellent results enemy aerodromes between Godego and San Fior and enemy encampments in the vicinity of Torre di Mosto Livenza."

The War Office statement, describing the previous night's raid, says:

"Yesterday evening enemy airmen, true to their innate barbarian impulses, which were revived by the defeat they suffered on December 26th at Treviso, bombarded inhabited parts of Treviso, Montebelluna, Castelfranco and Padua, all open cities. In the center of Padua, where the population is densest and the finest monuments numerous, eight bombs were dropped, killing thirteen persons and wounding sixty. There were only six soldiers among the casualties, which for the most part were women and children. No monument was damaged.

"In the other cities there were no casualties and virtually no damage."

The report of January 4th indicates that the Germans have in no way relaxed their efforts against Padua, but have continued their raids and increasing the toll of civilian lives. The announcement is as follows:

"Last night enemy aircraft made raids between the Piave and Bacchiglioni, and numerous bombs were dropped in inhabited parts, including Treviso and Padua. In the former city there were no casualties and only slight damage. In Padua, the center of which was chosen as a target with particular fury, some fires occurred and several private buildings were damaged. Six persons, among them two women and one old man, were wounded."

The Pope has protested against the raids on Padua.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
:/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

GEORGE BAUER, VICE PRESIDENT OF THE AERO SCIENCE CLUB OF AMERICA, DIES IN THE SERVICE OF UNCLE SAM

While serving with the colors, George Bauer, Vice-President of the Aero Science Club of America, succumbed to pneumonia.

With his death this country loses one of its most ardent workers in the cause of model aeronautics. Perhaps no one other model devotee can claim to have accomplished more in this development of the model aeroplane than George Bauer. Since the year 1907, when aeronautics was a science, the practicability of which was yet to be recognized, New York possessed a handful of enthusiastic young men who were determined to master the science and do what could be done from their standpoint to realize the objective set forth by those who believed that the aeroplane was destined to become an important factor in the affairs of the world. Yes, George Bauer was one of those young men, and it is safe to say his enthusiasm was unparalleled.

After long hours of work he, like his fellow workers, would come home only to find pleasure and interest in designing and building models and having no other time but evenings and Sundays would test his models by the aid of an arc lamp in one of the nearby parks, a difficult task, and when Sunday came would travel quite a long distance to Van Cortlandt Park, the Mecca of the model flyer, and there contest with his fellow members. Sometimes he would be victorious and sometimes not, but all the time maintaining an air of sportsmanship and contentment, a trait which earned for him a multitude of friends. When not a contestant his services as an official were always sought, for his decisions were fair and his knowledge of the model aeroplane supreme. Extreme heat or cold, rain or shine, he never failed to be there to contest or officiate.



The late George Bauer, a pioneer in the realms of model building, and who at the time of his death was giving his full energies to the work of Uncle Sam.

Soon after the formation of the Aero Science Club of America he was chosen to serve in the capacity of Vice-President, his fellow members recognizing his willingness to do his bit and his knowledge of aeronautics in general. In an effort to further co-operate with the model flyer he engaged in the model aeroplane business and for quite some time conducted a business much to the advantage of model flyers.

George Bauer was not only a patriot from the standpoint of being instrumental in the education of our young men in this new science, but it was what we might refer to as a greater pressure of patriotism that lead him to enlist in the services of Uncle Sam. Because of his practical knowledge of the gasoline motor he chose to serve in the quartermaster division as a mechanic and was put in the motorcycle squad and later transferred to the motor truck squad. It was while serving in this division that he took ill and died.

His death means a loss not alone to be shared by the Aero Science Club of America, but by the cause in general. The name George Bauer will be numbered among the pioneers who did much to develop the science and sport of model aeronautics, a cause that has helped and will help young men to positions of responsibility in the aeronautic world.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Hun Hen Frightfulness

The aged widow of a farmer who had heard forty bombs exploding in one parish, on being told that the total bag was twenty hens killed, exclaimed: "Fancy that, now, and just at the time of year when they begin to lay eggs."—*R. Stephenson in the Daily Mail.*

Too Evident

NERVOUS OLD LADY (*on small English air-'bus*): "Oh, dear! How we're rocking! I'm sure an accident will happen to this machine!"

ELDERLY ABORIGINAL: "It's along o' their bein' short-handed wi' skilled men, mum, so my son's orfered to drive her just to oblige, and (*confidentially*) I don't think 'e knows much about it."

"Aeroplane quality at submarnie prices" announces a placard in a fruiterer's window at Cardiff.

They were on a route march, and Brown had fallen out twice already. The third time the commanding officer came up to him and said: "I think you had better apply for a transfer into the R. F. C.—you'll only fall out once then."

The government still seems to think that, when Zeppelins are about, the best policy is to "play possum." But we must not confuse this with the Latin grammar interpretation of the word—"*Possum,* I am able."—*Whipped Topics.*

FOND MOTHER (*with the usual looking boy*): "Yes, my son wishes to enter the Air Service when he's old enough. You see, he always blows up his own tires; so, as he says, he'll know something about it."—*London Opinion.*

GRANNIE (*dragged out of bed at* 1:30 *a. m., and being hurriedly dressed as the bombs begin to fall*): "Nancy, these stockings are not a pair."—*Punch.*

Fooling More Than the Enemy

Rain was falling steadily as the weary cyclist plodded on through the mud. At last he spied a figure walking toward him through the gloom.

Gladly he sprang off his machine and asked the countryman: "How far off is the village of Poppleton?"

"Just ten miles the other way, sir," was the reply.

"The other way!" exclaimed the cyclist. "But the last sign-post I passed said it was in this direction."

"Ah," said the villager, with a knowing grin, "but, ye see, we turned that there post 'round, so as to fog those 'ere Zeppylings!"

Free Translations

"R. F. C." = Redoubtable Fighting Contingent.
"R. N. A. S." = Representing Nemesis at Sea.

RECRUITING OFFICER: "You realize the dangers before you? You are not afraid of having horses shot under you?"

SOCIETY RECRUIT: "Me? I had two motor boats explode under me, three autos start over me, and an aeroplane fall with me during the past social season alone!"—*Puck.*

The war-aviator is not too proud to fight, though he is generally above fighting.—*Boston Transcript.*

Zep. Raids and Subdued Light Caution

"Ain't you rather young to be left in charge of a chemist's?"

"Perhaps. What can I do for you?"

"Do your employers know it's dangerous to leave a mere boy like you in charge of such a place?"

"I am competent to serve you, madam."

"Don't you know you might poison someone?"

"There is no danger of that, madam. What can I do for you?"

"Think I had better go to the shop down the street."

"I can serve you just as well as they can, and as cheaply."

"Well, you may give me a couple of night-lights; but it doesn't look right."

Dutiful as Usual

IMPERTURBABLE JAMES: "I don't know whether you would like to see them, sir, but the Zeppelins have come."—*Bystander.*

Some Gas!

That young man in the train who scoffed at our gunners for not being able to hit a "gas-bag holding five million cubic metres of gas," must be the official who is on such friendly quarterly terms with *our* meter.

Now that French newspapers have been distributed over parts of Germany from aeroplanes, certain Sunday papers can scarcely claim the highest circulation.



"President Wilson's Message will be dropped over German territory by aeroplanes."—News Item.

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(*Continued from page 796*)

spar for a considerable distance on each side of the joint, without carrying too much weight. The vertical bolt, to which reference was made above, is not passed through the spar itself, but through an additional stiffening piece glued to the front face of the spar. Two horizontal bolts through the spar, securing on the rear fact of the spar the compression strut for the internal wing bracing, are the only attachment, apart from the glue, of this vertical packing piece to the spar proper. It is to be imagined that a pull on the inter-plane wire must result in a tendency to twist the spar, placed, as it is, so far from the vertical neutral axis of the spar. Altogether this joint impresses one as being very poorly designed indeed, in fact, it has the appearance of not being designed at all.

The outer inter-plane struts are stream-line steel tubes, with a diagonal tube welded to them in the manner shown in the illustrations. In addition to this diagonal tube there is a wire running diagonally in the opposite direction, probably to ensure that the welded joints of the struts shall not have to work in tension under the changes in load, caused by the travel of the centre of pressure.

The ailerons, which have their tips at a slightly smaller angle of incidence than that of the inner ends, are hinged to a false spar slightly to the rear of the rear main spar. The section of this false spar is shown in one of our sketches. The leading edge of the aileron is in the form of a steel tube, partly enclosing which—and at some distance from it—it a strip of three-ply wood, the object of which evidently is to provide the requisite depth of the leading edge of the aileron without going to the extra weight of a tube of sufficient diameter. The method of attaching the ribs to this tube is also indicated in the sketches. A short strip of thin steel is bent around the tube, its two ends projecting back, and being accommodated in a slot in the rib. This strip is then soldered (and probably pinned, although this could not be ascertained) to the tubular leading edge.

Half-way between consecutive ribs, in order to help it retain its shape, small distance pieces are tacked to the three-ply, having their free ends abutting on the surface of the tube. Another sketch shows the tube to which the inter-aileron strut is attached. The crank lever of the upper-aileron is a somewhat weird and complicated affair, having a forward projection curving up over the false spar, and dipping down in an opening between two ribs. To this projection is attached one of the aileron control cables, which runs over a pulley in the lower spar and internally in the lower wing to the cranks on the longtitudinal rocking shaft. In plan view the aileron crank lever is bent and runs through a rib, the clip attaching it to the inter-aileron strut being similar to that of the lower aileron shown in the sketch. From this aileron crank, a cable passes over another pulley in the same casing as that of the first, and hence through the lower plane to the controls. It will thus be seen that both elevating and depressing the aileron is a positive movement.

The tubular leading edge of the ailerons is supported by a small bearing at the inner end, and by two clips of steel bent over the tube and bolted to the false spar at certain intervals. Thus each aileron is carried in three bearings. The outer end of the leading edge of the aileron is free. A fact which at once impresses itself on one is looking at the lateral control of the Ago is that the point from which the aileron is actuated is very near its inner end, leaving a very large amount of the aileron area outside, a fact which must give rise to considerable twisting stresses.

The tail planes are of similar construction as that of the main planes, the same form of box spars being employed. The stabilizing plane is brought to the same level as the top of the fuselage, by dropping the lower longerons, somewhat after the fashion of the old Deperdussion monoplanes. A clip secures the front spar of the tail plane to the longerons, while the rear spar is attached by means of a sliding clip arrangement, which allows (not during flight) of adjusting the angle of incidence of the tail. The vertical fin, which is of tubular construction, is mounted on and moves with the tail plane. No very great amoont of adiustment is therefore possible, as a comparatively small movement of the rear spar of the tail plane brings the rudder against the edge of the cut out portion of the fin. (See illustration.) The rudder, which is also built of steel tubes, has no support above the stern of the body, this being difficult to obtain in conjunction with the adjustable fin. The result is that the rudder is very much overhung and does not look any too strong for its work.

New Curtiss Bond Issue

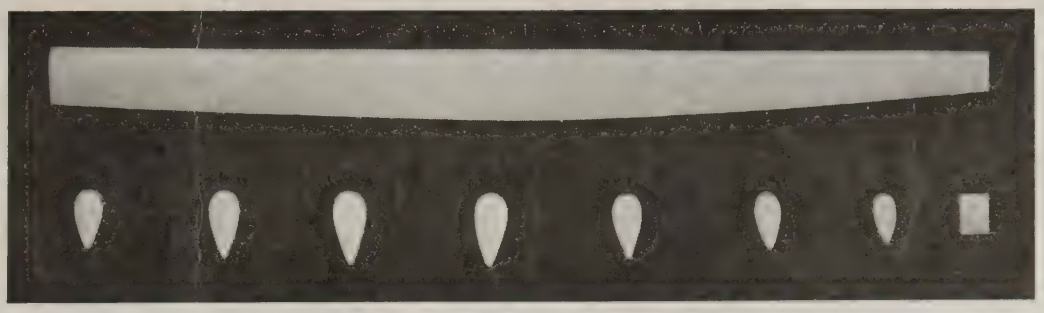
Directors of the Curtiss Aeroplane and Motor Corporation have decided, in order to simplify the process of securing the advances from the Government, through the War Credits Board, which are to be made in order to assist its production on war contracts, to create a new bond issue. It will consist of $15,000,000 of first-mortgage serial 6 per cents, dated Jan. 1, 1918, issued in six series.

Series A, of $359,000, maturing Jan. 1, 1919; Series B, of $356,000, maturing Jan. 1, 1920; Series C, of $348,000, maturing Jan. 1, 1921; Series D, of $328,000, maturing Jan. 1, 1922, and Series E., of $1,982,000, maturing Jan. 1, 1923, will be employed to retire, on a dollar-for-dollar basis, the present outstanding 6 per cent notes and the gold 6s of 1927. With the shortened maturity, no difficulty in this respect is expected, especially as the new notes, like the old, will be convertible into common stock at $50 a share, and callable at 102½.

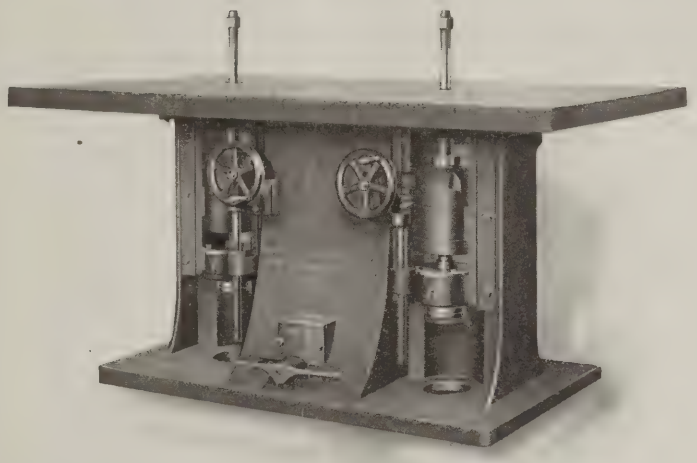
Series F, not convertible, and redeemable at par, is neither to be issued or sold, but deposited with the Government as collateral against the expected advance upon contracts, in order to provide the "proper security" required by law in case of a Government advance. Officials of the company explain that the entire operation is not, strictly speaking, a new financing operation, but is merely intended to simplify the company's financial position in respect to its funded debt, preparatory to the Government's advance on contracts. This advance became necessary in order to give the company a free hand and plenty of working capital for the near future, as the labor of financing its immense new plant had imposed a heavy strain upon the company's resources.

To be second Lieutenants, Aviation Section, Signal Reserve

Charles Harmon Shook, 40 S. Perry St., Dayton O.; Roger B. Stevens, Langley Field, Hampton, Va.; Henry Chapman Patten, c/o Lt. Sadler, Equipment Div., Signal Corps; Walter Carroll Hooper, Shirley Ave., Baltimore, Md.; Charles Harmon Kicklighter, 80 Oglethorpe Ave., Atlanta, Ga.; Stuart F. Kosters, 95 Main St., Hempstead, L. I., N. Y.; Rodney D. Williams; Bert McNeil; John William Slattery; Clarence E. Johns; Robert A. Weinhart; John C. Cowden; Frederick H. Pearson; Ernest G. Thornton; Austin Tunis Quick; Chas. B. K. Gillet; Frederick Walter Griffiths; Morgan Belmont; Charles W. Fuller; Joseph R. Farabee; Lawrence Hills; Kenneth Fouts.



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The Mechanics of the Aeroplane

The Mechanics of the Aeroplane, by Captain Duchene, is a valuable contribution to the literature on aeronautics. Its author is recognized as an authority because of his contributions to the development of the science for many years, while his actual military experience has been extensive. The present work has been awarded the Monthyon prize by the Academy of Sciences. It has not been written exclusively for the student of mathematics nor is it intenteded merely for the casual reader, but rather to present as simply as possible the main principles of dynamic flight. The reader gains an insight into the various problems concerning the equilibrium and motion of aeroplanes and learns how to calculate the various elements and conditions of flight. He is assured in the preface that all the mathematical knowledge required to follow the various experiments and calculations are familiar to the average school boy. A large part of the present volume is devoted to a discussion of the support of the aeroplane in still air, next the author considers problems of equilibrium and stability and finally takes up the effect of wind on the aeroplane. In a final appendix the design of screw propellers is discussed.

The Mechanics of the Aeroplane, A Study of the Principles of Flight, by Captain Duchene. This book is obtainable through The Aeronautic Library, 280 Madison Avenue, New York City. The price is $2.75 postpaid.

Design of Aeroplanes

The student of aeronautics, and especially the designers of aircraft and the draughtsmen engaged in such work, will find the present volume a valuable collection of useful data and methods of design. The engineer in most branches of science finds no lack of design and pocket books containing a compendium of useful information, but the science of aeronautics is still so young that authoritative books of this kind are rare. The mechanical engineer will here find collected and tabulated in convenient form an immense amount of valuable data. The comprehensive nature of the work may be judged from the headings of the chapters, which include discussions of general design principles, the estimation of aeroplane weights, design consideration, characteristic curves of performance, stresses in aeroplanes, principles of construction of the wing system, principles of under carriage design, fuselage design, etc. The author has included several valuable tables on the strength and properties of materials, weights, equivalents and general aeronautical data.

The Design of Aeroplanes, by Arthur W. Judge, A.R.C.S. This book is obtainable through The Aeronautic Library, 280 Madison Avenue, New York City. The price is $4.75 postpaid.

Dyke's Automobile Encyclopedia

Dyke's Automobile Encyclopedia is a book deserving of mention. Mr. Dyke, better known as Dr. Dyke (motor doctor), of St. Louis, published the first practical book on Automobiles in America. Mr. Dyke also originated the first auto supply company of America—1897. His twenty-one years of experience in the automobile business as a supply man and publisher is now represented in this new edition of this book.

The book isn't what you would term an Encyclopedia in the true sense of the word—yet it is the most complete reference work on automobiles so far published; any subject, trouble, remedy or repair you can think of, can be found in the 6,000 lines of index.

A beginner will learn the fundamental principles of each and every part of an automobile from the axle to the engine. All cars are covered in a distinctive and unique method, which is to teach the student the principles of the parts first, then explain the variance of construction afterwards. Complete specifications of all cars are given so the reader will understand the variance of construction of the different makes of cars.

The repair subject is probably the most interesting part of the book. There are 1,189 illustrations and 154 pages devoted to this subject alone. It is the most complete book on Automobile Repairing and Adjusting so far published.

Before taking up the subject of repairing and adjusting, you first learn the principle and construction of all the parts and then step by step you are taken through the subject of adjusting and repairing. Other instructions cover such subjects as: how to build a repair shop for home or business; how to equip the shop—from small tools to regrinding cylinders, tire repairs, welding, battery charging, etc., are thoroughly treated.

You are then taught—how to use tools; how to cut threads; how to distinguish S. A. E. and U. S. S. threads; how to use and read measuring instruments; how to solder, case harden, repair radiators; how to re-design old cars; how to straighten frames, fenders, etc.

There are 775 illustrations and 279 pages to the electric subjects in the book, including the storage battery and ignition subjects.

In addition to the book, there are two supplements on the Ford and Packard, with 332 illustrations and 91 pages, part printed in two colors. There are also five colored inserts. Also a dictionary.

The book is of real value to the student of aeronautical engines, and it may be obtained through the Aeronautic Library, 280 Madison avenue, New York. Price, $3.

Manual of Army Aeronautics

In this convenient little pocket volume will be found a surprising amount of information concerning the art of army aeronautics. Its authors have not intended to present the history of aeronautics or treat exhaustively of any particular phase of the science of aviation, but to furnish rather a practical text-book for the enlisted man of the aviation section. It is assumed that the dirigible has been superceded by the heavier-than-air machine and the lighter-than-air craft is disregarded. The instruction is eminently practical. One learns what is the make-up of an aero squadron, how the handling of machines is apportioned among the men, and the rank and authority of every member of the squadron. Practical advice is offered on unpacking planes, making wing patches, tuning up the craft, the care of motors, the operation of the electrical connections, and other details of actual operation. There are special chapters on Hunting Engine Troubles, Magnetos and Ignition, The Carburetor and The Four-Cylinder Operation. The student will find the pages on propellers, pitch and aeroplane surfaces, their care and control, of practical value, while the layman in such matters will find much interesting reading. One of the most interesting chapters deals with military photography and map-making and their value in modern warfare. Manual of Army Aeronautics, by G. W. Lynn and T. T. Gillen. This book can be obtained from The Aeronautic Library, 280 Madison Avenue, New York City. The price is 70 cents postpaid.

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Taken from a French bombing plane which has just dropped seven bombs on a German military storehouse in Lorraine (Official Photo)

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LORD ROTHERMERE STRIVES FOR ALLIED UNITY AND CO-OPERATION

IN an interview with a representative of the New York *Tribune*, Lord Rothermere, the new British Air Minister, expressed the hope that there would be "unity of effort in the air" in order to make more easy the attainment of Allied supremacy.

Lord Rothermere expressed the opinion that America, with its achievements in the realm of engineering, is destined to play a great part in attaining the mastery of the air for the Allied nations.

The new British Air Minister expressed the belief that American youths are admirably fitted for air service and destined to play a prominent part in air battles of the future.

In discussing this subject, Lord Rothermere said:

"During the last three years of the war many American citizens have distinguished themselves in the air services, both of the British Empire and of France. From my own observations, I believe that during the twelve months ahead American airmen in the American air service will prove that they are second to none. They possess all qualities of alertness, ability to make quick decisions and great personal courage, which are so essential in the making of a first-class flying man.

"I look forward to seeing, before many months are past, many hundreds of these splendid specimens of young American manhood, representing not only your great universities, such as Harvard, Yale and Princeton, but also those great educational establishments in the Middle and Far West, such as Chicago and California, and many another.

"In the days before the war, as a result of the Rhodes Scholarship, we had an opportunity at Oxford of getting to know many young Americans, some of whom doubtless will find themselves in the American flying service."

In speaking of unity of the air, Lord Rothermere said:

"Since my appointment as Air Minister, I have had the privilege of meeting the heads of the American air service, and I believe that the happy spirit of co-operation which already exists between the American and British forces on sea and land will prevail to even a greater extent, if that is possible, in the air.

"We have hard won experience; you have great resources. Let us make full use of both. I believe that if America will concentrate her marvellous energy and driving forces on this great problem of air mastery, despite all the difficulties of construction, lack of experience and transport, she will play a great part in obtaining that complete victorious peace which we have all set our minds on—a peace which entails the complete overthrow of Prussian militarism."

RELIES ON AIRMEN TO BREAK GERMANY

A SHORT time ago a New York dispatch to a London paper stated that American opinion was that Britain ranked last among the leading members of the grand alliance in air power. This statement was not controverted, because discussions affecting national susceptibilities at a time like the present are inopportune. Among air experts here there exists a confident belief that British efforts in the provision of aerial fighting craft and the training of men will prove equal to the necessities of the great aerial campaign expected in the spring, and that the balance in favor of the Entente will be tipped decisively by America's contribution.

In a statement prepared for the New York *Times*, R. R. Hearne, author of "Aerial Warfare" and a well-known authority on the subject, says:

"The Germans are now working with all their energy to carry the air war this year to every part of Britain within range. It will be a ruthless and terrible war unless we are well prepared. Big bombing machines with their 900-mile range of action can menace Glasgow and Belfast as well as London and the Midlands.

"Air operations will be on an immensely enlarged scale. Hence, when the Allies carry out their air war on Germany, the Huns in their very first experience of such raids will be treated to something far more terrible than the worst assault on London. Bearing in mind the underlying hysteria which exists in Germany, it will be understood that there is excellent opportunity for breaking the nerve of the war makers.

Railways to be Attacked

"With thousands of aeroplanes circling in and out of Germany night after night and day after day, with remote German towns made the centres of aerial battles, with the main railway lines battered at many places, troop trains wrecked and vital bridges like those of the Rhine demolished, we shall assuredly shatter the two nerve systems which have enabled Germany to defy the world so long.

"These two nerve systems are first, the nerve or will of the governing classes, who carry on the war, and second, the gigantic bundle of nerves known as the German railway system. Paralyze either of these nerve systems, and the way to a victorious peace is easy.

"So far in this war the governing classes of Germany have suffered very little and have profited very much. The war to them has been an exciting game. We have not been able to strike directly at these people, because they are well intrenched behind their armies. Losses have befallen them, but we have not been able to break their nerve nor have we been able to break the magnificent railway system of Germany which I may call her national iron nerve.

Says Air Campaigns is Best

"There is a very strong case, therefore, for a powerful attack on the two nerve systems by which Germany holds out so determinedly, and when we come to analyze methods by which we can make direct attacks on Germany's nerves

we find only one instrument available, the aeroplane. With our air fleets we can jump over the battle lines which form Germany's bulwarks. The air way is the only way to the heart of Germany. When we begin in earnest to carry the war into the interior of Germany, when we endanger German officialdom and German property, and when we break the inner wheels of the German traffic machine, then we shall see great changes.

"Some one may ask, 'but what is Germany tries the same method against the Allies?' Well, she has tried her hardest since the early days of the war. Count up the raids on London and Paris and see how they compare with the Allies' feeble attempts against important cities.

It is in this matter of smashing Germany's nerves that America will bring invaluable aid to the Entente Powers by her thousands of aeroplanes this year. American experts showed great intelligence when they pronounced in favor of a gigantic air program, and if the United States delivers the goods, as I feel sure will be done, we shall have the most important instrument of victory against Germany.

"I know the brilliant record of the American engineers in high speed production and now that the French and British air experts have been giving their war experiences to their transatlantic allies we may have every confidence in the realization of the overwhelmingly large air fleet which will beat Germany from the sky, invade her territory, and break her will to war."

President Wilson's Message Over Germany by Balloon

THE London dispatch published in the New York *Times*, stating that consideration should be given to finding a type of aircraft suitable for carrying President Wilson's message to the Germans without having the pilots incur the penalty of being shot if captured, as the Germans have threatened to do, resulted in a meeting being held at the Aero Club of America, at which were present: Messrs. Alan R. Hawley, President Aero Club of America; Henry Woodhouse, Member Board of Governors, Aero Club of America; Ralph H. Upson; R. A. D. Preston, who piloted the balloon which won the International Balloon Race in 1913; Augustus Post, who was with Mr. Hawley in the memorable balloon trip in 1910, when Mr. Hawley and Mr. Post started from St. Louis and landed in the wilds of Canada, having been in the air for forty-six hours.

The consensus of opinion of these experts, who have had experience with all types of aircraft, is that President Wilson's message can best be distributed among the Germans by using small free balloons, tying between 100 and 1,000 copies of the address to each balloon and setting them free.

The Allies have a great many of these small balloons, which they inflate with hydrogen and send out in great number daily to find out the direction of air currents in connection with their aerostatic and artillery work.

Each of these balloons could probably carry from 10 to 100 copies of President Wilson's address. Larger balloons could be obtained to carry more, in proportion to their size. Hydrogen lifts about 70 pounds per thousand cubic feet.

It was agreed by all these experts that the winter conditions will facilitate carrying out this plan, because, as the ground is covered with snow and ice, there are practically no vertical air currents, and the balloons, after being launched, will drift in the direction of the prevailing currents, with little possibility of their being sent higher or lower where they might meet with contrary currents which would carry them back over the Allied lines. The balloons would only be launched after ascertaining the direction of the wind.

Messrs. Upson and Preston recently took advantage of wind currents to travel with three passengers in a balloon from the Goodyear station at Akron, O., to the Goodyear station at Toronto, Canada and succeeded in reaching Toronto. It was by taking advantage of prevailing air currents that they won the International Balloon Race in 1913, which started from Paris, France. Through this achievement, the International Balloon Trophy was brought back to the United States.

The Aeroplane Spruce Situation

A SPECIAL committee of the Aero Club of America, which has studied the aeroplane spruce situation, and has found the principal causes which are behind the delay in the production of spruce and are delaying the entire aircraft production program, has reported that the trouble is mainly an economic one; that the lumber men cannot produce aeroplane spruce at the price set by the Government; and the problem can be solved by adopting in this case, as in other cases, the cost plus ten per cent plan.

In the following letter from Mr. Alan R. Hawley, President of the Aero Club, to Mr. Howard E. Coffin, Chairman of the Aircraft Board, Mr. Hawley urges the immediate adoption of the cost plus ten per cent plan to avoid further delay in the production of the much needed aeroplane spruce, as follows:

"Mr. Howard E. Coffin, *Chairman,*
"Aircraft Board,
"Washington, D. C.

"Dear Mr. Coffin:

"(1) We have read with much concern the public statement issued from Portland, Ore., by Colonel Bryce P. Disque, the officer of the Signal Corps of the Army, in charge of the production of the spruce needed for the construction of the military aeroplanes.

"(2) Colonel Disque states that the Army needs 11,000,000 feet of spruce a month, but 'we are only getting 3,000,000 feet a month.' He states, further, that the Government will pay a bonus on all deliveries of spruce prior to February 28, 1918. The prices quoted in the press dispatches are: '$90 per thousand feet f. o. b. at point of inspection, plus a bonus of $40 per thousand feet for all pieces accepted up to January 31, and a bonus of $30 per thousand feet for all accepted up to February 28.'

"(3) The Spruce Committee of the Aero Club of America, which has kept in touch with the spruce situation throughout these months, and is familiar with its various problems, has reported to the Executive Committee that the delays are mainly due to the fact that the price fixed by the Government for aeroplane spruce is too low and involves the spruce mills in large financial losses. To solve this problem, the Committee urges the Executive Committee to urge the Government to adopt the cost plus ten per cent profit plan.

"(4) The report of the Spruce Committee says, in part:

"The U. S. Signal Corps at Portland, Ore., are doing their utmost to increase the output of spruce lumber, but many obstacles have to be overcome which require both time and money before the output comes up to requirements.

"The Western lumbermen say they cannot cut the lumber for the price offered by the Government Spruce Production Bureau, because the quality schedule and standard of inspection have been raised since they agreed to furnish the lumber at a price of $105 per 1,000 feet, and they can only meet the new schedule at a financial loss. The lumbermen claim that under the old schedule 40 per cent of the lumber cut from a No. 1 spruce log (the very best logs) would pass inspection. Only 50 per cent of cutting stock is allowed by the new schedule and the other 50 per cent, or wing beam stock, must be perfect lumber 18 feet long, which is very hard to obtain from even the most perfect logs. Under the old schedule the mill man expected to get 40 per cent, or 400 feet, of aeroplane lumber from each 1,000 feet at $105 per thousand feet. This lumber would bring $42, and the balance of the log cut into box lumber at $18 per thousand feet brought $10.80—or a total of $52.80 per thousand feet. Under the new schedule, passing only 5 per cent, or 50 feet at $105 equals $5.25, and 950 feet of box lumber at $18 equals $17.10, makes a total of only $22.35 for the lumber from logs which are worth from $20 to $35 per thousand feet in the log market. According to the above figures it is impossible for the mills to produce the lumber without a financial loss. The more they produce the greater is their loss.

"Another economic aspect of the problem is that the large mills are organized for quantity cutting of logs for ordinary purposes, where no time is spent in inspecting logs during cutting, to select the straight grain parts clear of knots. This inspection is necessary to select clear, straight grained aeroplane spruce, and it slows up the entire organization and causes a large loss of many hours. This increases the deficit of the lumber mills.

"The adoption of the cost plus ten per cent plan will solve this problem, which is purely an economic one.

"There are a great number of mills in the Northwest idle at present mainly because it does not pay to operate them for the production of aeroplane spruce. The cost plus ten per cent plan will make it possible to operate them.

"Under this plan the mills will also be able to pay increased salaries to the workmen and get better service and larger production. As the daily cost of the war is so enormous, the additional cost due to increased salaries is of no consequence compared with the value of the time saved in the production of the aeroplane spruce.

"(5) The Spruce Committee's report is rather lengthy and deals with the difficult aspects of the problem, including the transportation of logs. If your board is interested, we shall be glad to transmit the rest of the report. We touched only on the economic problems in this letter, because this is the one problem which can be solved immediately by the adoption of the cost plus ten per cent plan.

"Assuring you again of the hearty co-operation of the Club, I beg to remain,

"Your very cordially,
"(Signed) Alan R. Hawley, *President,*
"Aero Club of America."



THE NEWS OF THE WEEK



Rubber Association to Act as Crude Rubber Consignee.

The Rubber Association of America, which recently went on record in favor of a large aviation appropriation, have been appointed by the War Trade Board to act as consignee of importation of crude rubber from foreign countries. This is a notable tribute, not only to the effective work of the Association, but specifically to the good work of the special "Committee on Rubber and Kindred Products" of which Messrs. Wilson, Hotchkiss, Work, Spadum, Bruyn, Hodgman, Kelly, Huxley and Vorhis are members.

The Special Aircraft Committee of the Rubber Association has been in conference with the Council of National Defense in Washington.

Secretary's War Views before Senate Military Committee.

..AVIATION SECTION, Signal Corps.

"The Aviation Section of the Signal Corps on the first Day of April, 1917, consisted of 65 officers and 1,120 men. On the 1st day of January, 1918, it consisted of 3,900 officers and 82.120 men.

"This division of the War Department was charged by Congress with the expenditure of an appropriation aggregating, for 1918, $744,000,000, or five times the 1915 appropriation for the entire War Department.."

Professor Ames Sees Shortage of Aeroplane Mechanics.

Professor Joseph S. Ames, who was sent abroad last spring by the National Research Council, in an article in the *Atlantic Monthly*, declares it will be a year before even small numbers of mechanics will be trained in the repair of Liberty Motors. He bases his statement on a conversation with Major Vincent. In the course of his article, Professor Ames says: "So far, we have made one aeroplane suitable for use in Europe."

Professor Ames continues:

"We are having a large number of school planes made, but there are no engines for these. The man who was entrusted with the work has fallen down completely. Even if we were to have the school planes ready, we do not have one-tenth the requisite number of teachers, and cannot hope to get them for six months."

Kelly Field Largest Flying School in World.

According to the *San Antonio Express*, Kelly Field No. 2 is now the largest flying school in the world. "The building formerly occupied by non-flying officers' school will be used to accommodate the increasing number of flying students, which now total 300. In all, there will be 1,200 men in Kelly Field in the flying branch of aviation. Practically all of the flyers formerly training in Field No. 1 have been moved to Field No. 2 in order that the distinction in the work done in those fields may be as clear as possible. A new building has been built at Kelly Field No. 1 to house the Ground Officers' training school. It is the largest building on the field next to the warehouse. In this school all of the administrative officers will be trained. The remainder of the field is devoted to the two training brigades, the supply and quartermasters' departments. Col. W. D. Chitty, commanding officer at Kelly Field, anounced that he had notified the War Department that Kelly Field could take care of a total of 60,000 men."

Oil Control Board Formed.

Mark L. Requa, of Oakland, Cal., was appointed head of the newly formed Oil Division of the Fuel Administration. The immediate work to be undertaken is a thorough investigation of the petroleum situation. The newly organized division is empowered to regulate prices.

Mr. Requa is a consulting engineer of the Bureau of Mines, Vice-President of the Institute of Mining Engineers and a member of the Council of the Mining and Metallurgical Society. Mr. Requa was associated with Bernard M. Baruch before our entry in the war in several mining promotion matters.

St. Louis Aircraft Company to Produce Three Aeroplanes Daily.

The St. Louis Aircraft Corporation will have their plant in St. Louis in full operation within a few weeks and will produce three aeroplanes daily. A. J. Seigel, President of the Huttig Sash and Door Company organized the company. The St. Louis Car Company will make the metal parts required and much of the wood work will be done in the Huttig factory.

Curtiss Declares Dividend.

The Curtiss Aeroplane and Motors Coropration of Buffalo has declared its semi-annual dividend of 3½% on preferred stock, payable on January 15th.

Personal Pars.

Charles B. Page, formerly general manager, Duesenberg Motors Corp., Chicago, is now works manager of same company at Elizabeth, N. J.

R. B. Jones, formerly chief draftsman, Curtiss Aeroplane Co., Buffalo, is now aeronautical production engineer, Curtiss Aeroplane & Motor Corp., Buffalo.

U. S. Shipbuilding Co. to Make Aeroplanes

In connection with its new shipbuilding works at San Diego, the U. S. Shipbuilding Co. of Los Angeles, will establish a department to build aeroplanes.

General Motors Making More Liberty Motors.

It is understood that contracts for Liberty aeroplane engines held by the General Motors Corporation, and being filled by the Cadillac and Buick companies, have been increased. The original order is stated to be for 1,000 motors, and this has been increased by a new contract, calling for the completion of 50 Liberty motors daily for an indefinite period.

United Motors Manager Enlists.

George P. Sweet, manager of the United Motors Company of Grand Rapids has been commissioned a captain in the aviation section of the Signal Corps.

R. H. Upson Pilots Goodrich Balloon.

R. H. Upson succeeded in piloting a Goodrich spherical balloon from the Akron plant of the Goodrich Company to the new factory at Toronto, Ont., a straight line distance of 325 miles. Four passengers accompanied the pilot. It is a difficult task to guide a "free" balloon to a fixed destination, but Mr. Upson was able to accomplish the feat.

Curtiss Output 12 to 15 Planes Daily

Buffalo.—According to a dispatch in "Automotive Industries," the Curtiss Aeroplane & Motors Corp. is turning out from 12 to 15 machines daily, and is preparing to increase this output in 1918. The volume of shipments for the last six weeks has been about $3,000,000. It is estimated that by March the monthly turnover will be $5,000,000.

Caleb Bragg Awarded Curtiss Marine Trophy.

The Contest Committee of the Aero Club of America has awarded the Curtiss Marine Flying Trophy for 1917 to Mr. Caleb S. Bragg, holder of Hydroaeroplane Pilot Certificate No. 70.

Mr. Bragg was requested by the Liberty Loan Committee of New York to fly to Troy and distribute Liberty Loan literature on the cities en route and entered this flight in competition for the Curtiss Marine Flying Trophy with the sole purpose and understanding that should he be declared the winner, the prize money of $1,000 would be donated by him to purchase comforts and necessities for American aviators in the Army and Navy.

This trip was made on October 26, 1917, Mr. Bragg with Mr. Philip Boyer as passenger, leaving Port Washington, L. I., at 10:14, going a litle north of Manhattan Island, then up the Hudson River to Troy, circling over this city and landing there at 12 noon. They started on their return trip at 1.40 P. M. and arrived at Port Washington, L. I., at 4:40 P. M., having made a non-stop flight back from Troy. The machine used in this flight was a Wright-Martin Hydroaeroplane, equipped with a 150-h. p. Hispano-Suiza motor.

The Curtiss Marine Flying Trophy, offered by Mr. Glenn H. Curtiss through the Aero Club of America, consists of a trophy valued at $5,000 and $5,000 in cash, or its equivalent to be divided into five equal annual prizes.

This trophy was first competed for in 1915, when there were twelve entrants. Seven contestants made flights of over 150 miles; Major Oscar A. Brindley, flying a Martin Military Tractor Hydroaeroplane, covered a distance of 443.72 miles between San Diego and San Juan, California (making several laps), and was awarded the trophy for that year.

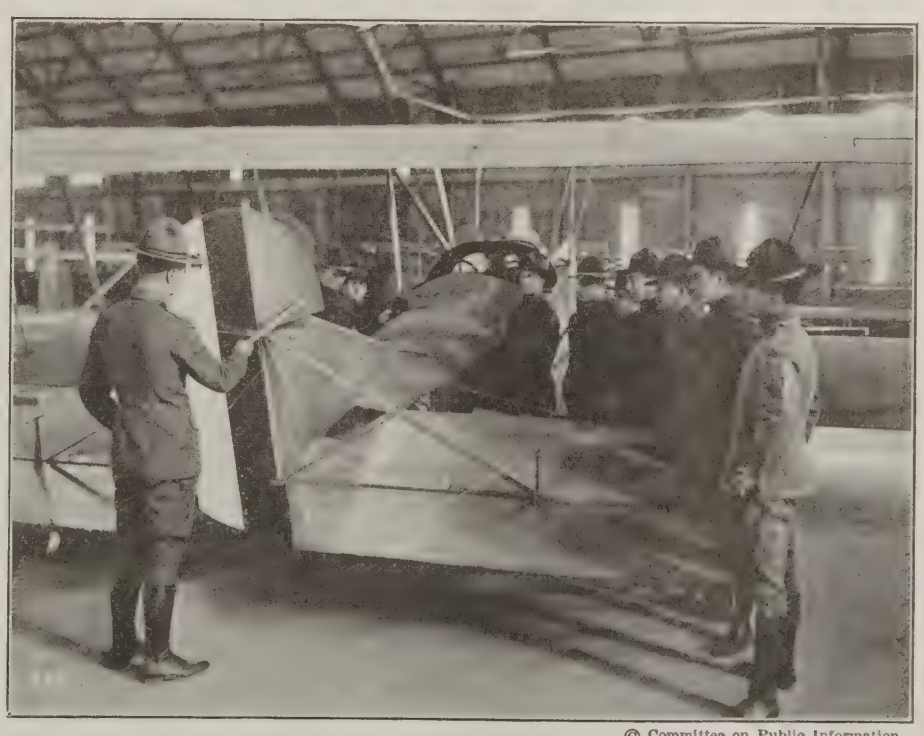
There were six entrants for the trophy in 1916, the winning flight being made by Mr. Victor Carlstrom on August 26, over a course from Newport News, Va., to Fisherman's Point, in a Curtiss twin-motored hydroaeroplane, covering a distance of 661.44 miles.

Three applications for entry were received for the 1917 trophy, the only flight made being that of Mr. Bragg, who covered a distance of 296.92 miles.

The rules governing the 1918 competition for the Curtiss Marine Flying Trophy will be the same as those drawn up for the 1917 contests.

Stewart to Make Aeroplane Wheels.

Indianapolis.—The Stewart Wire Wheel Corp. of Frankfort, Ind., has signed a Government contract to manufacture 4,500 wire wheels for aeroplanes.



© Committee on Public Information

Instructor explaining principles of lateral control to the students of one of the "Ground Schools"

Aircraft Inspectors Band Together

Detroit.—The Detroit Aircraft Inspectors' Club, composed of the engineers who construct and inspect aeroplanes in this city, has been organized for more complete co-operation in the work of the members. Capt. James Haeslett, who has charge of the Government aircraft equipment in the city, and Captain Hotchkiss of the Washington division of aircraft equipment, addressed the members. The officers elected follow: President, Lieut. E. T. Jones; vice-president, George Gray; secretary-treasurer, A. T. Davidson. Monthly meetings are scheduled. It is stated that the first of the Detroit built war planes was successfully demonstrated during the past week.

War Savings in a Nutshell

Q. What is the War-Savings Plan?
A. It is a plan by which you can lend small savings to your Government at four per cent interest, compounded quarterly.
Q. How may this be done?
A. By purchasing War-Savings Stamps and Thrift Stamps.
Q. What is a War-Savings Stamp?
A. It is a stamp for which the Government will pay you five dollars on January 1, 1923.
Q. What does it cost?
A. Between $4.12 and $4.23 during 1918, depending upon the month in which purchased.
Q. What is a Thrift Stamp?
A. It is a stamp costing twenty-five cents, to be applied in payment for a War-Savings Stamp. It does not earn interest. The purpose of its issue is to enable people to accumulate in small sums the amount necessary to pay for a War-Savings Stamp.
Q. Where can I buy them?
A. At post offices, banks and authorized agencies.
Q. Why should I buy them?
A. Every dollar loaned to the Government helps to save the lives of our men at the front and to win the war.

1,000 S. A. E. Members Added in 1917.

At the closing meeting of the 1917 Council of the Society of Automotive Engineers held today, the rolls of the society showed a total membership of 3,119 as of January 1, 1918. This represented an increase of 998 members during the year. As the membership a year ago was 2,121, the increase during the year approximated 47 per cent.

Bureau of Forestry Supplies Information on Wood for Aircraft.

In the November 5th issue of "Aerial Age Weekly" there appeared an article on page 331, entitled "Technical Considerations on Materials Employed in Aeroplane Construction," by Ottorino Pomilo. It was recently learned that the tables which accompanied this article were compiled by the U. S. Bureau of Forestry.

Admiral Harris Testifiies Before House Committee on Seaplane Production.

Representative Venable of Mississippi took issue with Representative Britten's critcisms of the Navy Department's delay in constructing seaplanes, when he pointed out that though America was nine months at war, our seaplane supply and output was hopelessly inadequate. Representative Venable's reply was based on testimony of Admiral Harris. In this statement, he says that the "work of organization has been largely done" in his opinion and that the results "do not seem as big as they really are." Representative Venable states that "the required number of planes will be turned out and be ready at an early date."

132,000,000 Feet of Spruce Needed in 1918.

What is expected of loggers and mill men in the Northwest by the production division of the Aircraft Board during 1918 has been outlined in a statement and an appeal made by Colonel Brice B. Disque, head of the spruce production work, to the members of the Loyal Legion of Loggers and Lumbermen. The organization number 245,000 members in the northwest. The statement warns lumbermen not to heed spies and traitors who spread propaganda in the spruce belt.

Haskelite to Occupy New Plant.

The Haskelite Company, which is manufacturing veneer parts for aeroplanes, is starting work on a new plant. Pending its completion, one of the new buildings of the United Motor Truck Company will use for experimental work in making of aeroplane parts.

Chief Engineer of Bosch Company Buys Interest in Simms.

Victor W. Kliesrath, former Chief Engineer of the Bosch Magneto Company has acquired an interest in the Simms Magneto Company of East Orange, N. J., and will devote his entire time as consulting engineer of this company. New types of magnetos will be produced.

Navarre to Attempt Trans-Atlantic Flight.

In an interview with "l'Echo des Sports," Jean Navarre, the erratic French airman, who was discharged from the French Aviation Service because of his wild escapades, announced his intention of making a flight across the Atlantic.

Navarre considers that the flight can be made in two types of machines; either a fast light scout plane, capable of more than 125 miles an hour, or a big slow Caproni or Handley-Page type of machine, which can maintain an average speed of 80 to 90 miles an hour.

Navarre favors the latter type. He plans to carry a crew of three men, all of whom will be mechanics and pilots and will take turns in piloting the machine on its thirty hour flight. The weight of the machine to be used, he estimates at 12 tons, including all supplies and provisions, and will be equipped four 300 horsepower motors. It is inteded, after running ten hours, at which time the fuel consumption will have reduced the weight of the entire aeroplane to nine tons, to operate only three of the motors, thus maintaining the same average rate of speed.

Aeroplanes from Indianapolis.

Preliminary incorporation papers have been filed by several well-known Indianapolis business men who intend to organize a corporation to manufacture aeroplanes in Indianapolis. The company has been capitalized at $1,000. The directors of the company include Albert D. Johnson, secretary-treasurer of the Diamond Chain & Mfg. Co.; A. B. Jennings, a real estate dealer; Lewis Wallace and Joseph T. Markey, attorneys, and George H. Cottrill, a lumber dealer.

John Purroy Mitchel Now Major in Aviation Section.

John Purroy Mitchel, former mayor of New York City, an ardent advocate of preparedness, has received a commission as Major in the Aviation Section of the Signal Corps. He will probably report in San Diego, Cal., within a month.

Mr. Mitchel sought a commission in the infantry, but as this was not obtainable under the rules of the Department he accepted the offer which had been extended to him by Major-General Squier, to accept a commission in the Aviation Section.

Durable Factory Floors

A problem that confronts factory engineers is that of making the floors of workshops and assembly rooms as dustless as possible, and it is with satisfaction that we record some interesting facts concerning "A-C Metallic Concrete Hardener" which is being tested widely with most gratifying results.

It is said that business is founded on *stability* and *efficiency*. Build a solid foundation and you have stability. Improve on that foundation and you have stability plus efficiency, making for permanency.

A building that will resist wear and tear from without as well as within, must have stability in tensile and compressive strength. Modern materials of construction that make for these desired qualities, are steel, stone and concrete.

To deal, then, with the latter, assuming the former have had their proper handling—let us dwell briefly on a treatment that makes cement floors, hard and wear-proof.

Ordinary floors are made of sand, water and cement. They date back to antiquity. No need of further analysis here.

Concrete however, due to its inherent defects is "porous"—which implies dust and gradual wearing down into holes from tear and wear, which makes for a speedy dissolution. We come then to the conclusion that such concrete for flooring is bad.

Experience has shown that the addition of a metallic concrete hardner in the making of concrete floors, will render the floors dustless and wear-proof.

Metallic concrete hardner is an ingredient composed of particles of steel and iron chemicals treated. Each particle must have a rough jagged shape, so as to firmly adhere to the cement.

Continuous wear to which concrete floors is subjected, will not in any way consume the life of a concrete floor which has been treated in its construction with a metallic concrete hardner. Even the treading and moving of heavy machinery or trucking cannot even scratch such a surface. The life of such a floor is indefinite.

The United States Government has specified the use of a metallic concrete hardner for the floors of the permanent buildings at Langley Aviation field, being constructed by the J. C. White Corporation and the Newman Cavallon Co. of 8 West 40th St., New York, have been awarded the contract to finish the necessary hardener for the floors.



A late type of Farman fighting machine having a speed of 100 miles an hour

NAVAL and MILITARY AERONAUTICS

Special Orders 1.

Capt. Peirce D. Schenck, Aviation Section, Signal Reserve Corps, is assigned to active duty and will take station at Dayton, Ohio, and report by telegraph to the Chief Signal Officer of the Army for duty.

Capt. Alfred H. Thiessen, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Granville M. Smith, Jr., Aviation Section, Signal Rerserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Frank M. Bartlett, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from November 23, 1917.

The travel performed by Capt. Willard S. Kelly, Signal Reserve Corps, on December 18-20, 1917, in proceeding from Philadelphia, Pa., to Hoboken, N. J., on temporary duty in connection with the Signal Corps, and upon completion thereof in returning to Philadelphia, is confirmed as having been necessary in the military service.

First Lieut. Joseph M. Cramer, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Carlstrom Field, Arcadia, Fla., for assignment to duty.

First Lieuts. Jesse C. Ross and Orange W. Starr, Medical Reserve Corps, are assigned to active duty with the Aviation Section, Signal Corps, and will proceed to San Antonio, Tex., and report in person to the commanding officer, Kelly Field, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

Second Lieut. George R. Foddy, Jr., Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed with the least practicable delay to Detroit, Mich., and report in person to Capt. Paul B. Holmes, finance department, equipment division, Packard Motor Car Co., for duty.

The following-named officers, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the Chief Signal Officer of the Army for duty: Capt. Henry W. Butler, Second Lieut. Steuart L. Pittman, Second Lieut. John E. Sloane, Second Lieut. Walter Mayher Boyden.

First Lieut. Sidney T. Thomas, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Tyler Morse, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Kelly Field, South San Antonio, Tex., and report in person to the commanding officer for duty.

Second Lieut. Elmer R. Ford, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Portland, Oreg., and report in person to Col. Brice P. Disque, Yeon Building, for duty.

Second Lieut. Walter C. Hooper, Aviation Section Signal Reserve Corps, is assigned to active duty and will report at once to the Chief Signal Officer of the Army for duty.

First Lieut. E. J. McGrath, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Detroit, Mich., and report in person to Capt. Paul B. Holmes, Aviation Section, Signal Reserve Corps, Packard Motor Car Co., for duty.

First Lieut. Frank W. Macomber and Second Lieut. Sidney A. Loeb, Aviation Section, Signal Reserve Corps, are assigned to active duty and will proceed without delay to this city and report upon arrival to the Chief Signal Officer of the Army for duty.

First Lieut. Dean Hole, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Scott Field, Belleville, Ill., for duty.



Lieut. L. Resnati, of Caproni fame, now in the United States

First Lieut. Frederick W. Norton, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Fort Worth, Tex., for duty.

The following telegraphic orders from the War Department, of December 22, 1917, are announced: The following-named first lieutenants, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty: Ali Hassan, Jr., LeRoy L. Brown, Alfred W. Redfield, Ray A. Barnes, Alfred N. Joerg, Frank E. Harding, George E. Wagoner, James M. Bovard, Paul F. O'Neil, Robert M. Carrigan, James Barbour Rixey, Earl M. Harvey.

First Lieut. Martin M. Daugherty, Aviation Section Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Chanute Field, Rantoul, Ill., for duty.



Major Campbell, of the British Royal Flying Corps, now organizing a school for aerial photography in the United States

First Lieut. Herbert R. Lawrence, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report upon arrival to the commanding officer, aviation depot, thereat, for duty.

Capt. J. E. Whitbeck, Aviation Section, Signal Reserve Corps, is assigned to active duty and will take station in Buffalo, N. Y., and report by wire to the Chief Signal Officer of the Army for duty.

Second Lieut. Andre M. Lynch, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Army Balloon School, Fort Omaha, Nebr., for assignment to duty.

Second Lieut. Keith Jones, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Fort Worth, Tex., for duty.

First Lieut. Maurice A. Sharp, Aviation Section Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Gerstner Field, Lake Charles, La., for assignment to duty.

First Lieut. Bernard Shalit, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to South San Antonio, Tex., and report in person to the commanding officer, Kelly Field, for assignment to duty.

First Lieut. Ralph Curtis Mallory, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. Murdoch Bannister, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will proceed to South San Antonio, Tex., and report in person to the commanding officer, United States Aviation School, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

First Lieut. Harold L. Bancock, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will report in person to the officer in charge, physical examining unit, Aviation Section, Signal Corps, Boston, Mass., for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

First Lieut. John W. Elliott, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for assignment to duty.

First Lieut. John J. Gallagher, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for assignment to duty.

Second Lieut. Ben H. Hanby, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding general, Southern Department, Fort Sam Houston, Tex., for duty.

Second Lieut. Matthew G. Ely, Aviation, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer for assignment to duty.

First Lieut. Arthur L. Foster, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. William P. Bates, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Fort Sam Houston, Tex., for assignment to duty.



French Official Photo. From International Film Service

American aviators "somewhere over there," gathered about a French plane in which they are to make flights

First Lieut. James Gordon Bennett, Aviation Section, Signal Reserve Corps is assigned to active duty and will report in person to the commanding officer, Camp Taliaferro, Hicks, Tex., for assignment to duty.

First Lieut. John Frederick Baker, Aviation Section, Signal Reserve Corps, is assigned to active service and will take station as a member of the aviation examining board at New Haven, Conn.

First Lieut. Joseph A. Eldridge, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Love Field, Dallas, Tex., for assignment to duty.

First Lieut. John E. Dowling, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

Second Lieut. Magruder Dent, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Stanley Huguenin, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aviation depot, Garden City, Long Island, N. Y., for assignment to duty with a squadron.

First Lieut. John B. Hayes, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Wilbur Wright Field, Fairfield, Ohio, for assignment to duty.

First Lieut. Henry Strong Culp, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Scott Field, Belleville, Ill., for assignment to duty.

First Lieut. Carter Tiffany, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from October 2, 1917.

Second Lieut. Roy C. McDowell, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceeed without delay to Mount Clemens, Mich., and report in person to the commanding officer, Selfridge Field, for assignment to duty.

First Lieut. Charles E. Muller, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Hazelhurst Field, Mineola, Long Island, N. Y., for assignment to duty.

Second Lieut. George K. Mack, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Capt. Joseph D. Sears, Signal Reserve Corps. is assigned to active duty and will proceed from Washington, D. C., to New York, N. Y., and report in person to the department signal officer, Maritime Building, for assignment to duty as commandant of the Military School of Ground Photography at Columbia University, that place.



© Kadel & Herbert. Official photo

Late type of British air scout being used on Italian front. Note four-bladed propeller

First Lieut. Henry B. McGill, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Portland, Ore., and report to Col. Brice P. Disque, Yeon Building, for duty.

First Lieut. Penrose B. Metcalfe, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Fairfield, Ohio, and report to the commanding officer, Wilbur Wright Field, for assignment to duty.

Capt. Reuben Hitchcock, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Portland, Ore., and report in person to Col. Brice P. Disque, Yeon Building, for assignment to duty. The travel directed is necessary in the military service.

First Lieut. Lorenz K. Ayers, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding general, Taliferro Field, Fort Worth Tex., for assignment to duty.

First Lieut. John K. Hampton, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. Ralph G. Nichols, Ordnance Reserve Corps, is assigned to active service and will take station at Berwick, Pa., for duty at the plant of the American Car & Foundry Co. and report by letter to the Acting Chief of Ordnance, Washington, D. C.

First Lieut. Alfred Craft Wainwright, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Ellington Field, Houston, Tex., for assignment to duty.

First Lieut. Charles S. Williams, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aviation general supply depot, Garden City, Long Island, N. Y., for assignment to duty.

First Lieut. Harry L. Vitzthum, Signal Reserve Corps, is assigned to active duty, will proceed to College Park, Md., and report to the officer in charge, Radio School, Maryland State Agricultural College, for duty.

First Lieut. Paul N. Rooney, Aviation Section, Signal Reserve Corps, is assigned to active service and will report to the commanding officer, Army Balloon School, Fort Omaha, Nebr., for duty.

Second Lieut. C. W. Stanley Parsons, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Aviation concentration camp, Millington, Tenn., for duty.

First Lieut. William C. White, Signal Reserve Corps, is assigned to active duty and will proceed to Little Silver, N. J., and report in person to the commanding officer, Camp Alfred Vail, for duty.

First Lieut. George P. Sweet, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. John F. Moffett, Aviation Section Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aviation general supply depot, Garden City, Long Island, N. Y., for duty.

Capt George R. Phipps, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., in time to report to the Chief Signal Officer on or before January 3, 1918, for assignment to duty.

Maj. Resolve P. Palmer, Signal Corps, is relieved from his present duty and will proceed to the Presidio of Monterey, for duty with the 8th Field Signal Battalion.

Capt. Eugene A. Lohman, Signal Corps, is relieved from his present duty and will proceed to Fort Bliss, Tex., for assignment to duty with the 7th Field Signal Battalion.

Capt. Abbott Boone, Signal Corps, will report in person to the commanding general, Philippine Department, for assignment to duty.

Capt. Stanley L. James, Signal Corps, is relieved from duty in the Philippine Department and will proceed via the first available transport to San Francisco, Cal., and upon arrival at San Francisco will report by wire to the Adjutant General of the Army for further instructions.

First Lieut. Robert T. Fisher, Aviation Sec-

tion, Signal Reserve Corps, will proceed to Fairfield, Ohio, and report in person to the commanding officer, Aviation General Supply Depot, Wilbur Wright Field, for assignment to duty.

First Lieut. Kenneth E. Griffith, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Aviation Depot, Garden City, Long Island, N. Y., for duty.

The following officers, Aviation Section, Signal Reserve Corps, are assigned to active service and will report to the commanding officer, Aviation Depot, Garden City, Long Island, N. Y., for duty:
First Lieut. Harry B. Hartman.
First Lieut. Ernest Love.
First Lieut William Dudley Robbins.

First Lieut. Edward Butts, Jr., Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, aviation depot, Garden City, Long Island, N. Y., for duty.

The following-named officers of the Medical Reserve Corps are assigned to active duty with the Aviation Section, Signal Corps, and will proceed to South San Antonio, Tex., and report in person to the commanding officer, Kelly Field, that place, for duty, and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: Capt. Frank F. Bowman, Capt. Henry J. Jurgens, Capt Frederick C. McIsaac, Capt Alfred P. Webb, First Lieut. William R. Haynie, First Lieut. Tazwell D. Rowland, First Lieut. George W. Thume, First Lieut. James F. Wood.

Capt. Charles B. Crane, Aviation Section Signal Reserve Corps, is assigned to active duty and will proceed at once to Berkeley, Cal., and report in person to the commanding officer, School of Military Aeronautics, University of California, for duty.

First Lieut. R. C. Burky, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Camp Taliferro, Hicks, Tex., for duty.

Second Lieut. George P. Ames, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed without delay to Mount Clemens, Mich., and report in person to the comanding officer, Selfridge Field, for duty.

Capt. Sydney H. Hooker, Signal Corps, will proceed to Camp Hancock, Augusta, Ga., and report in person to the commanding officer, Signal Corps detachment, for duty.

First Lieuts. Julius C. Turcott and Emund C. Turner, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report in person to the commanding officer, Aviation Balloon School, Fort Omaha, Nebr., for duty.

The following named officers of the Medical Reserve Corps are assigned to active duty with the Aviation Section, Signal Corps, and will proceed to San Antonio, Tex., and report in person to the commanding officer, Kelly Field, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: Capt. Emmet R. Bucklew, First Lieut. Robert B. Pryor, First Lieut. Irving W. Steiner.

First Lieut. Harold M. Graham, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Wilbur Wright Field, Fairfield, Ohio, for duty.

Capt. Ernest B. Black, Aviation Section, Signal Reserve Corps, is assigned to active duty and will take station at Kansas City, Mo., and report by telegraph to the Chief Signal Officer of the Army for duty.

Paragraph 80, Special Orders, No. 269, War Department, current series, is amended to read as follows: Verbal orders of the Chief Signal Officer of the Army directing Maj. Edward P. Currier, Aviation Section, Signal Corps, to report for duty October 17, 1917, are hereby confirmed and made of record.

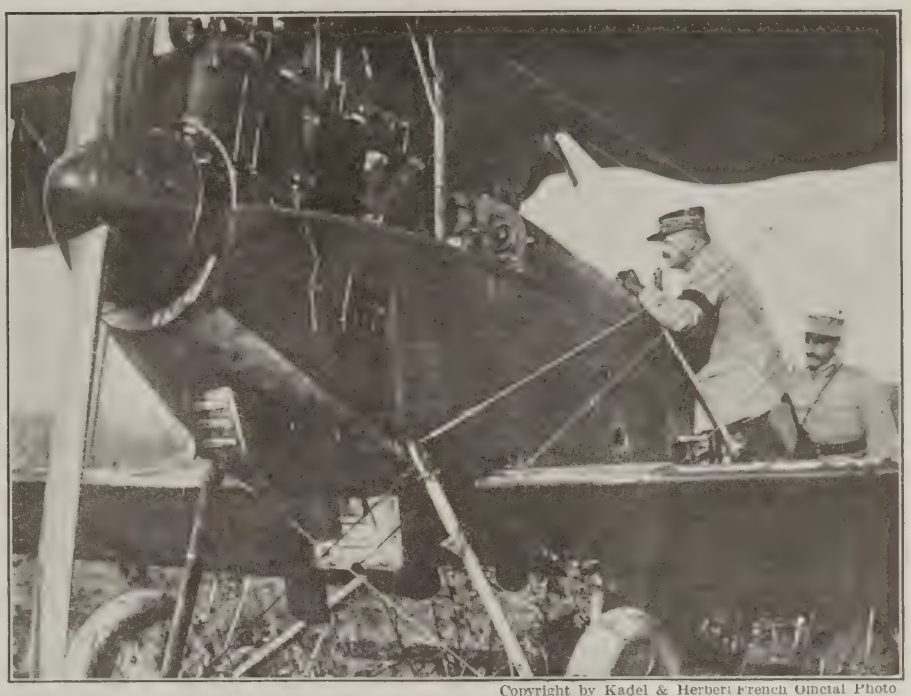
Second Lieut. De Forrest A. Horning, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Army Balloon School, Fort Omaha, Nebr., for duty.

First Lieut. Jesse F. Malloway, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Rockwell Field, San Diego, Cal., for duty.

First Lieut. Harley H. Pope, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Post Field, Fort Sill, Okla., for duty.

First Lieut. Waldo C. Johnston, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the president of the Aviation Examining Board created at Washington, D. C., under paragraph 47, Special Orders, No. 246, War Department, October 20, 1916, for duty.

First Lieut. John B. Jaqua, Aviation Section, Signal Reserve Corps, is asigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.



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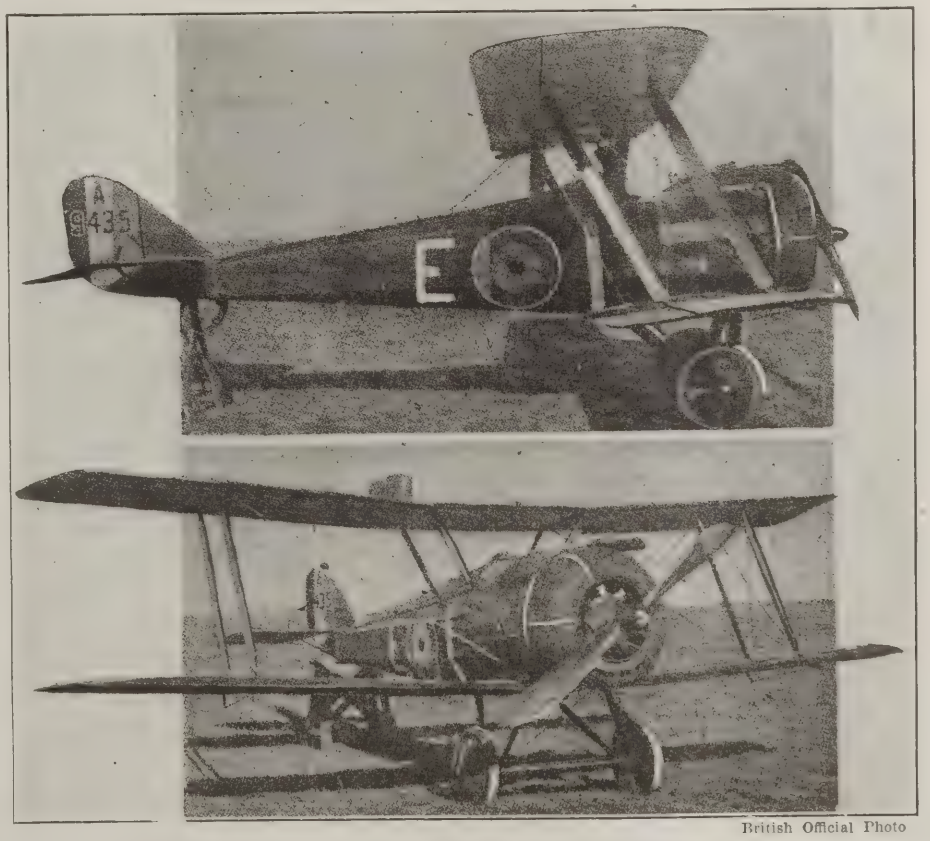
Gen. D'Esprey inspecting a new German fighting plane recently brought down by French anti-aircraft guns in the Aisne district

Second Lieut. John R. Ridlon, Aviation Section, Signal Reserve Corps, will proceed from Washington, D. C., to Waltham, Mass., take station, and report by telegraph to the Chief Signal Officer of the Army for duty.

The following named officers of the Medical Reserve Corps: First Lieutenants Samuel E. Brown and Samuel E. Mitchell are assigned to active duty with the Aviation Section, and will proceed to Kelly Field, San Antonio, Texas.

First Lieut. Cuthbert Tunstall, Aviation Section, Signal Reserve Corps, active duty Aviation Depot, Garden City, L. I., N. Y.

First Lieut. Joseph M. Mulford, Aviation Section, Signal Reserve Corps., active duty, reporting to Chief Signal Officer of the Army for duty.



British Official Photo

A British de Havilland biplane. The top plane is staggered backward



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Constructing aeroplane landing gear. In order to withstand the great, sudden and heavy shocks, each piece has to be selected with the utmost care, and is reinforced with binding and metal joints

Major Morton D. Stone, Aviation Section, Signal Reserve Corps, active duty, reporting to Chief Signal Officer for assignment.

Second Lieut. Daniel R. Seagrave, Signal Reserve Corps, active duty at Camp Alfred Vail, Little Silver, N. J.

First Lt. Robert M Cowham, Aviation Section, Signal Reserve Corps, active duty, reporting to Chief Signal Officer for assignment.

Second Lieut. Harry Hayden, Aviation Section, Signal Reserve Corps, active duty reporting to Chief Signal Officer for assignment.

First Lieut. Thomas E. Baxter, Aviation Section, Signal Reserve Corps, active duty at Chanute Field, Rantoul, Ill.

Captain Louis V. Froment, Aviation Section, Signal Reserve Corps, active duty reporting to Chief Signal Officer for assignment.

Second Lieut. William J. Foster, Aviation Section, Signal Reserve Corps, active duty reporting to Chief Signal Officer for assignment.

First Lieut. Robert C. Harrington, Aviation Section, Signal Reserve Corps, active duty at Wilbur Wright Field, Fairfield, O.

The honorable discharge of First Lieut. Henry Darcy Schudder, Jr., Signal Corps, National Guard of the United States (N. J.) as of date of August 7, 1917, is announced.

THIRTEENTH ANNUAL S. A. E. CONFERENCE AROUSES GREAT INTEREST

AERONAUTICS DOMINATE DISCUSSIONS

(Original Drawings by Norman E. Jennett)

THE Thirteenth Annual Conference of the Society of Automotive Engineers, held in New York City, January 9-10, resolved itself almost entirely into a discussion of the nation's aeronautical program.

The Standards Committee meeting on January 9th was one of the busiest sessions ever held in the New York headquarters, when more than half of the time was occupied by reading, discussing and voting on the voluminous report of the Aeronautical Division which contained no less than twenty-three standards.

The Business Session on January 10th demonstrated the rapid strides the organization had made during the last year, when the membership had been increased by nearly fifty percent.

The Professional Session on the afternoon of January 10th, was given over almost entirely to a discussion of the "Reasons Behind the Liberty Aircraft Engine," which were given by Colonel V. E. Clark, Major Jesse G. Vincent and Mr. H. M. Crane.

"Fuel for Automotive Apparatus" was the subject of an excellent paper by Dr. E. W. Dean, and Messrs. A. F. Milbrath, A. W. Copeland, G. W. Carlson, C. T. Myers and Major W. M. Britton discussed the "Reasons Behind the U. S. War-Truck Designs."

The Automotive Industries dinner was held in Hotel Biltmore, January 10th, when there were over a thousand diners. President Dunham presided, Mr. John Kendrick Bangs was toastmaster and the speakers included Chairman Howard E. Coffin, of the Aircraft Board; Major I. G. Vincent, Capt. M. E. de Jarne, of the French Military Mission; General P. Tozzi, of the Italian Military Mission; and Charles F. Kittering, the President-elect of the S. A. E.

Standards Committee Session

IT is realized that aircraft engineering is as yet in a state of rapid development and what may seem best to-day may be greatly improved upon within a year. Therefore it has been decided to refer to all of the completed work of the Aeronautic Division as "Recommended Practise" and not standard.

Upon the opening of the meeting by Standards Committee Chairman Utz, Standards Manager Hanks read his report. It reviewed the work done by the Standards Committee in cooperation with the Government, toward the development of the Liberty truck and in the standardization of certain features of motor-cycles.

After a certain amount of work had been done along each of these lines the Government took complete charge and selected committees of desigining engineers who continued the work of design at Washington.

Taking up the subject of aeronautic standard Mr. Hank said:

The aeronautic war standards were required to be turned over to the Government in the shortest possible time. It was not practical to ask the Government to wait six months for the S. A. E. to pass the standards through the usual route. A short cut was authorized by the council, permitting results arrived at at any division meeting to be released immediately to the Government Bureaus needing the standard.

The Government representatives were always present at these meetings, so they were in the closest touch with all conditions from both engineering and manufacturing standpoints. On all these recommendations which went to the Government by short route, a notation was entered at the bottom of each, reading:

This practise has been recommended by the Aeronautic Division of the S. A. E. in co-operation with representatives of the U. S. War Dept. (or other departments co-operating.)

If, for any reason, your requirements cannot be brought into harmony with this practise, please notify promptly the Society of Automotive Engineers, 29 West Thirty-ninth Street, New York City, returning this sheet with comments thereon.

This practise recommended represents the consensus of opinion of the advisong engineers as of (date on which the recommendations was made.)



Major-General George O. Squier, Chief Signal Officer and head of the Army Air Forces, was there in spirit, but had to stay in Washington to hold down his job



Chairman Howard E. Coffin, whose Aircraft Board must provide tens of thousands of aircraft needed to win the war in the air for the Allies

In order that these recommendations might be of the greatest possible value and be available when wanted, they were printed or mimeographed on standard letter-size paper and placed in loose leaf binders with the S.A.E. emblem on the cover, and sent to those in charge of the various Government bureaus.

In much of the standardization work heretofore attempted, a careful review of American practise with American engineers was all that was necessary. This procedure did not fully meet the requirements in the aeronautic field, as our aeroplanes are going abroad and the experience of both the foreign builders and ourselves must be co-ordinated. The I. A. S. B., composed of engineering representatives from the United States, Canada, England, France and Italy has been the medium for this co-ordination, and many S. A. E. members are on this board.

The Aeronautic Division has held a total of twenty four meetings during the year 1917, including sub-committee meetings. The largest number of meetings held by any Division in previous years was by the Engine and Transmission Division who had seven in 1916.

The amount of business transacted by the Standards Division is illustrated by their offering for consideration a list of some sixty-five recommendations. In 1916 a total of thirty-eight standards were passed and forty-five meetings held. In 1917 there were 109 meetings, and the total number of standards passed for final action was 122.

Aeronautic Division Report

First the report of the Aeronautic Division was taken up, C. M. Manley, chairman of this division, presenting it. In, several sections of this report, references were made to government departments in the capacity of purchasers, and it was decided that it would be better to make the recommended practise of general application and to this end substitute the word "customer" for the Signal Corps or other department of the Government.

In the cellulose nitrate report the wording "according to the standard method of the Bureau of Ordnance" is to be replaced by "the Standard Government Method of the Abel Stability Test." The Signal Corps absolutely objects to the use of tetrachlorethane and an item was therefore inserted to the effect that dopes containing tetrachlorenthane will not be acceptable. With these amendments the report was adopted.

Dr. Smith of the Bureau of Standards said that the specifications were not ideal but they were practical. The Signal Corps was drawing up specifications for its own use which were being based on the report of the Division. It was hoped to incorporate in these specifications a test for durability, but the work in connection with this test had not yet been completed. Later on, it was the intention to also draw up specifications for a non-inflammable nitrate dope on which tests are now being made.

Dr. Percy Walker of the Bureau of Standards presented the report on spar varnish specifications. One objection was the great latitude allowed in the temperature range in drying the varnish for the bending test. It was decided by the sub-committee to limit the range to 21-24 deg. C. instead of from 21-32 deg. C. as originally proposed. It was stated that Mr. Hanks had sent out a circular to different varnish makers asking for criticism of the proposed change and that the comment made had on the whole been favorable. Mr. Walker, however, pointed out that there was no lack of criticism of the work of the sub-committee and that the hot water test proposed had met with particularly strong objections. Mr. Costello, representing the Signal Corps, said that there was quite a possibility that they would omit the hot water test from their specifications. Grover Farnsworth, an aircraft engineer, on the other hand, agreed with Dr. Walker regarding the utility of this test. The report was adopted without further amendments.

Glue Report

Presenting the report of the sub-committee on glue specifications, Mr. Manly said that he expected more op-



President George W. Dunham, who guided the S. A. E. during its last year



"General" Alan R. Hawley, President of the Aero Club of America, who began to lead the small army of enthusiasts of the Aero Club of America, who fought the elements, beginning in 1906 and who holds the distinction of being the only man who piloted Wilbur Wright in a balloon flight. This was in 1908 in France. Mr. Hawley has a reputation of always being ready for a good flight or a good fight and he looks as though he can lead the now enormous aerial army of aeronautic enthusiasts for many years to come



Colonel V. E. Clark, who is playing an important part in America's participation in the air war

position to this report than to any other. One change that was suggested and accepted without opposition was that wherever the term "the government" or the name of any department of the government appeared, it should be replaced by "the customer."

The report as presented specified that "the glue must be a high grade hide glue," but it was brought out that hide glue is at present practically unobtainable in this country. Glue is manufactured from hoofs, bones and other parts of the animal and it seemed to be the opinion among glue manufacturers that the part from which the glue is made is not such an important factor as the process of manufacture. To get around this it was suggested that the word "hide" be replaced by the word "animal." Another point to which objection was raised, was the requirement that the strength test of the glue be made by means of two pieces of maple or birch having a shearing strength of at least 2400 lbs. per square inch. It was pointed out that if the longitudinal shearing strength was meant, this seldom exceeds 1500 to 1600 lbs. per square inch and that woods of this kind showing 2400 lbs. shearing strength were absolutely unobtainable.

Mr. Manly said that there had been some discussion regarding this figure, which had been based on information furnished by the National Forest Products Laboratory. Another suggestion made was that the second illustration in the report, showing a double shear test block, be omitted. This suggestion came from Mr. Manly, who said that he had had very poor results from test blocks of this kind, as the blocks would invariably spread and the glue not fail under shear but rather under tensile stress. It was finally decided to refer this report back to the committee with instructions to gather information as to what shearing strength could reasonably be specified for the test pieces of maple birch.

Steel Wire Specifications

In connection with the specifications of round high-strength steel wire, objection was raised to the torsion test. According to the specifications, a sample of the wire not less than 10 in. long and gripped by two vices 8 in. apart, must be capable of being twisted a number of times equal to the constant 2.7 divided by the wire diameter in inches. It was asserted that it was absolutely impossible to get large diameter wire which would meet with this requirement.

It was therefore agreed that the number of turns which the sample must be able to stand should be equal to a constant factor to be agreed upon between the customer and the manufacturer, to be divided by the wire diameter in inches. The adoption of this amendment also made it necessary to eliminate the third column in a table accompanying the report. With these changes the report was adopted.

Next the subject of non-flexible steel wire cable was taken up, and quite a spirited discussion ensued regarding the best method of rust-proofing the wire. The report as presented required that the cable be uniformly coated with pure tin. Mr. Manly stated that the U. S. Government preferred galvanized cable and that his firm used such cable at the present time. The International Aircraft Standardization Board, on the other hand, favors tin covered cable. Mr. Erickson of the Canadian Aircraft Board, who represented the I. A. S. B. at the meeting, said that tinning the cable not only insures greater strength compared with galvanizing, but also facilitates soldering. He stated that differences in strength of as great as 8 per cent in favor of the tin cable had been shown.

Mr. Manly said that he had been discussing the matter with Mr. Horn of the Roebling Steel & Wire Co. who favored the galvanized cable, while other makers seemed to favor the tin cable. The Roeblings were willing to make either kind, but were very anxious that one of the two be decided upon so that it would not be necessary to maintain equipment for both tinning and galvanizing. Mr. Birdsall stated that experience had shown that galvanizing—he referred to hot galvanizing—always weakened a wire cable or a chain cable. Mr. Erickson said that the chief reason why the I. A. S. B. favored tinning was that the tin formed a better base for solder. It was moved that the word galvanized be substituted for the phrase "coated with pure tin" and also that a footnote be inserted to the effect that the method of galvanizing (if used) be specified by the customer. This amendment was adopted.

A further amendment was in regard to the torsion test which was amended to correspond to the torsion test for the round high-strength steel wire, it being left to the customer and manufacurer to agree up on the number of turns which the test specimen must be capable of withstanding. The report with these amendments were adopted.

American Cable Proves Best

Report on flexible 6 x 7 and 7 x 7 steel wire cable were adopted without change. In connection with the report on extra flexible 7 x 19 steel wire cable, Mr. Erickson pointed out that the Roebling cable of this denomination was made up of strands containing each three wires of different size. This resulted in extra strength, and the Roebling cable was considerably stronger than British cable of the same denomination having strands made up of equal wires. It was therefore decided to amend that part of the report relating to this matter to read as follows: "It is to be understood that the strand composing this cable must not necessarily be composed of wires all of the same diameter." With this change the report was adopted.

Mr. Birdsall asked whether it was not necessary to provide an elongation test of flexible cable. To this Mr. Manly replied that such a test was unnecessary, as every cable before being put in place on an aeroplane was stretched to 50 per cent of its tensile strength.

There was no comment on the recommendation for cable reels, which consisted of a dimension diagram and a table. This was adopted.

Next the tachometer drive specification was taken up. It was pointed out that the design of this drive was one of the difficult problems of aircraft engine design. The report as it stood had been revised a number of times and represented much work. Major Vincent, in reply to a question, stated that as far as he knew the Signal Corps was satisfied with the design. It was pointed out that the members of the sub-committee had given the subject very careful attention and that it would be safe to pass the specification as submitted, which was done.

Rubber Hose for Gasoline

Next the specifications for rubber hose for gasoline were taken up. Mr. Tuttle, of the Bureau of Standards, who read the report as printed, suggested a number of changes. Under the heading "Chemical Properties" it was specified in the original draft that



"no organic matter other than para or plantation rubber shall be used in the preparation of this hose."

Considerable objection to this requirement developed, and he made an amendment that the passage be changed to read as follows: "If organic matter other than para or plantation rubber is used in the preparation of this hose, the amount and identity of such material shall be stated." Mr. Hale, of the Goodyear Tire & Rubber Co., said that the rubber manufacturers asked that the first paragraph be eliminated. Concerning Mr. Tuttle's modification he said that the rubber companies would decline to give the ingredients in their product. He thought that the physical tests were very rigid and entirely protected the purchaser. Also, it was not within the province of the S. A. E. to require manufacturers to disclose what might be trade secrets with them. Mr. Tuttle replied that all of the physical tests described were made on new hose and did not bring out the durability of the product. Mr. Hale said that in his opinion the physical tests were absolutely adequate. The specifications were based upon the practise of the Royal Aircraft Board of Great Britain and that board did not require the composition to be stated. All sorts of hose, including air hose, water hose and fire hose, were being sold on the strength of physical tests alone.

Another change suggested by Mr. Tuttle, based on recommendations made by manufacturers, was that the percentage of rubber in the hose be not less than 25, instead of 32, as called for in the original specifications. Mr. Crane suggested that the specifications of tubes of larger internal diameter than ¾-in. which "may be made from rubber sheet, in which case they must consist of at least two complete turns" were not sufficiently explicit, and, at his suggestion, the following was added to this paragraph: "And be formed into a complete tube in the further process of manufacture." With these changes the complete report was adopted.

The above was followed in the report by specifications of plain hexagon nuts, ball hexagon nuts, castle hexagon nuts, ball hexagon head bolts and plain hexagon head bolts. Mr. Ehrman, criticizing the manner in which the data regarding these parts were presented, recommended that the basic or nominal size be expressed in decimals of four figures and that all decimals in the tables which represented common fractions of an inch have the fraction added thereto in parenthesis.

Threads of No. 12 Nuts

In connection with this subject, a rather warm discussion arose regarding the number of threads specified in No. 12 nuts. Grover Farnsworth of the Navy Aircraft Department wanted to know why 32 pitch was specified for these nuts, claiming that it was impossible to get dies and taps for this pitch. It appears that the former standard pitch for this size was 28. Mr. Ehrman denied that it was impossible to get the necessary tools for cutting these threads. He asserted that it was impossible to get quick delivery on gages for any of the common size screw threads. If better delivery could be obtained on gages for 12-28 thread it was due to the fact that this thread was in very little use and there was a comparatively small demand for gages of that size. According to Mr. Manly the subject was first taken up with the Signal Corps about a year ago.

The Curtiss Aeroplane Company at that time was using 12-32 screws in its JN model, and inasmuch as the government wanted quick production of this model, it was decided that no change should be made in the size of the thread used. Mr. Manly said that inasmuch as the 12-32 screw had already been adopted by the Society there remained nothing for them to do but to decide upon nuts that would fit these screws.

Mr. Hanks said that a committee should be appointed to confer with representatives of the Army and Navy and with the I. A. S. B. to clear up any little discrepancies which might arise. According to Mr. Erickson of the I. A. S. B., such a meeting is to be held at Washington on Friday at the new headquarters of the Board.



John N. Willys, always a progressive and still going

In the printed report were given tables and illustrations of turnbuckles, shackles, clip ends and clevis pins, and it was explained that these were put in merely for the purpose of giving the committee a chance to check them up for any typographical or similar errors, and that it was not necessary to take any official action on them. Specifications for aeroplane engine tests were adopted without change, as were the aeronautic engine testing form and the engine weight specification form.

Longer Plug Threads Urged

There was some opposition to the passage of the spark plug shell specification in the form presented. A letter had been received by the committee in which it was claimed that the length of thread was not sufficient to carry off the heat effectively. It was pointed out, however, that spark plugs with 5/8-in. length below the hexagon had not been the standard in automobile practise for two years, and more and more engineers were coming to use it. In further reply to the objection in the written communication it was stated that the heat dispersing capacity was much more a matter of thread fit than of thread length. Mr. Ehrman moved that the angle of the chamber, which in the report was given as 35 deg. for the lower end and 30 deg. for the upper end, be made 35 deg. for both ends.

Mr. Birdsall advocated the use of a longer thread in view of the fact that spark plugs are now generally screwed into the cylinder wall instead of into the valve caps, as formerly. If the spark plug has a long thread the water can be brought close to it, which is not the case if the thread is short. He related an experience where the shell of the plug had become discolored from the heat.

Mr. Manly said that there were not many 200 h. p. engines in which the metal of the plug did not change in color when working under the full load. This did not matter, as the ability of the plug to withstand high temperatures depended mainly upon the porcelain. The report was accepted with no other amendment than that regarding an equal chamfer of 35 deg. on both ends.

Next on the program was a table of bevel washers. Mr. Manly explained that these bevel washers had always been a source of considerable expense, as they generally involved a milling operation in their production. To reduce this expense it was decided to make them of rolled stock. It is not very practical to punch round washers from this rolled stock, and so Mr. Manly suggested that a series of square washers be added to the round washers, which could be readily produced from the rolled stock by sawing.

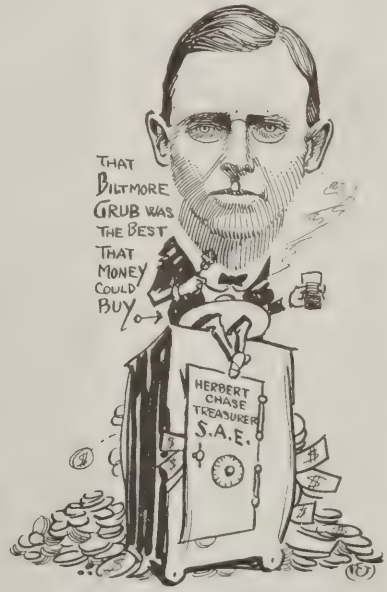
These bevel washers are to be made with angles of 6, 12, 24, and 36 deg., and by combining washers, a compound washer can be obtained approaching any desired angle within 3 deg. Besides being cheaper to make, the square washer permits of more accurate alignment of the bevel surface and the bolt. The



Dr. S. W. Stratton, who keeps his eye on the standards



Elmer A. Sperry, master navigator under, on and over the water



Herbert Chase "came across" in good shape at the banquet!

adoption of this report without change concluded the work of the aeronautic section.

The Business Session

Chas F. Kettering, vice-president of the Dayton Engineering Laboratories Co., is the president-elect of the Society of Automotive Engineers.

Kettering has been connected with the Dayton Engineering Laboratories Co. since 1909. Prior to that he was engineer in charge of development work on electric apparatus for the National Cash Register Co. He was graduated from Ohio State University in 1904.

David Beecroft, who is directing editor of the Class Journal Co., and has been active in society affairs for a number of years, is first vice-president. The complete slate follows:

President — Chas. F. Kettering, vice-president Dayton Engineering Laboratories Co.

First vice-president—C. C. Hinkley, president and general manager Hinkley Motors Corp., representing motor car engineering.

Second vice-president — Geo. H. Houston, representing aviation engineering.

Second vice-president—Fred Glover, Emerson-Brantingham Co., representing tractor engineering.

Second vice-president—Henry R. Sutphen, vice-president Submarine Boat Corp., representing marine engineering.

Second vice-president—H. R. Brate, representing stationary internal combustion engineering.

Secretary-General Manager — Coker F. Clarkson.

Treasurer—Chas. B. Whittelsey, vice-president Hartford Rubber Works.

Councillors 1918—B. B. Bachman, engineer Autocar Co., Ardmore.

H. L. Horning, engineer Waukesha Motor Co., Waukesha, and chairman Automotive Section of the War Industries Board.

C. W. McKinley, chief engineer, Willys-Overland Co.

George W. Dunham, past president.

Russell Huff, past president.

Councillors 1919—Chas. S. Crawford, chief engineer Premier Motor Corp.

Chas. M. Manly, vice-president and chief engineer, Curtiss Aeroplane Co.

J. V. Whitbeck, chief engineer, Chandler Motor Car Co.

The Professional Session

The most important topic before the Professional Session, the "Reasons Behind the Liberty Aircraft Engine," gave plentiful room for discussion at all points, and the three addresses were followed by half an hour of questions from the floor, which were answered by Major Jesse G. Vincent, formerly vice-president of the Packard Motor Company, who, with Major Hall of the Hall Scott Company, was called into the reserve engineering service last July and designed the Liberty motor.

The account of performance and production possibilities given by the speakers seemed to bring general satisfaction, but what put the final touch on the general conviction, apparent among most of the engineers, that the Liberty motor was actually living up to its promises, was the statement made at the close of the discussion that several of the allied Governments have placed orders in this country for the motors.

Much information about production had to be withheld for military reasons and figures as to the actual speed which the motor will develop were not given for the reason that the designers of the engine were careful to point out that the planes themselves are a very important factor in this consideration. But the following points as to the Liberty motor were brought out in the course of the afternoon's discussion:

1. The primary consideration in design was the meeting of the known possibilities of production by American factory methods. Certain features of foreign engines, the building of which required highly specialized factory technique such as was not compatible with quantity production would be impossible for use in the enormous number of aeroplanes which is contemplated by the American aircraft program. The designers had to consider the present capacities of production in American factories by American methods, as well as the possibilities of increase.

2. All the engineering talent in the American aeroplane and automobile industries was placed at the disposal of the Government, so that when Majors Vincent and Hall settled down to the completion of the design they had available all the information possessed by American manufacturers and the researches previously made by some forty or fifty other engineers. The motor which resulted is said by those who were engaged in its design to combine the best points of all motors hitherto designed in America.

3. Although the possibility of production was the first desideratum, it is asserted that the Liberty motor is as good as, if not better, than any foreign engine now being built. When the work of designing the new motor was just begun the allied Governments were asked for suggestions from the engines now in use in their aircraft. All of the major allies replied that they were severally engaged in developing a new and better motor. In consequence, with the aid of such suggestions from allied sources as were of use and those contributed by the American engineers, the designers set to work to build an engine which should embody all the improvements likely to be thought of abroad during the period of design and construction. They feel confident that when the Liberty motors are actually in use on the western front there will be no foreign motor of equal worth in use.

4. Liberty motors are now being turned out and American aeroplanes are being equipped with them every day. When the tide of production is in full swing they will be wholly standardized, but at present while standardization is in effect with regard to most parts a few must for a little time to come be made individually because the master gauges are not ready for all factories.

5. Although it was not definitely taken up in the meeting, it was declared afterward by the Chairman, Charles M. Manly, Vice-President of the society, chief inspecting engineer of the Curtiss Aeroplane and Motor Company, and a member of the National Aircraft Standards Board, that every possible provision is being made for the improvement of the design with the least possible interference with production. Aeroplanes are rapidly being improved, of course, by the interchange of captured machines with new devices between the opposing armies, but the men who are in charge of the Government's aircraft program are said to feel that the system of production will make it possible to introduce new features or improvements on later lot orders so that the Government will never be tied up with a great number of obsolescent machines in process of manufacture.

Later, Major Vincent declared he believed that with all the alterations that might be necessitated by subsequent experience, 95 per cent of the present features of the Liberty motor would be retained.

6. "Many thousands" of Liberty motors will be turned out in the year 1918, and American factories will be able to produce at least twice as many per week as they would be able to manufacture of any foreign type of engine.

The Liberty motor is to be used on machines of every type—speed scouts, battle planes, observation and bombing machines, and seaplanes, though those at present in process of manufacture, according to Major Vincent, are intended only for heavy battle and bombing planes.

There are only two varieties—a high-pressure engine for the use of battleplanes at very high altitudes, where the atmosphere is rarified, and a low-pressure motor for the use of seaplanes working principally in the detection of submarines, and hence near sea level, where the air pressure is heavy. As showing the endurance of the motor it was said that the high-pressure engine designed for use three or four miles in the air had been run consecutively for eight hours at sea level without showing any weakness. In the vacuum chamber of the Bureau of Standards in Washington, where conditions of temperature and air pressure obtaining 35,000 feet in the air—two miles higher than any aviator has ever flown—can be simulated, the high-pressure Liberty motor has been run for fifty consecutive hours. This, of course, is longer than any possible flight, for no aeroplane could carry enough gasoline.

The new Liberty engine will develop something more than 400 horse power at 1,625 revolutions per minute, the highest number possible with the present propeller design. Incidentally it may be remarked that improvements in the propeller are part of the plan of inventors now working on the improvement of the engine. It weighs about 800 pounds. All the motors are twelve-cylindered, with two spark plugs to each cylinder.

Questions from the floor were aimed at a comparison of this with the Rolls-Royce motor, regarded as one of the best of foreign design. Major Vincent said that the Rolls-Royce, with a weight of 950 pounds, had never authentically developed more than 360 horse power. Some one asked if it were not true that the Rolls-Royce could really do better than that. "I don't know," he said, "but I do know that the Liberty motor can do fifty horse power better than the Rolls-Royce. As a matter of fact, the Liberty motor has possibilities which have not been completely fathomed as yet. We have something up our sleeve."

The average of only two pounds weight per horse power, according to Major Vincent, was something that Continental designers had desperately tried for and failed. The Hispano-Suiza motor, used in the best French machines and made to some extent in this country, weighs two and a half pounds per horse power.

H. M. Crane, who as chief engineer of the Wright-Martin Company is manufacturing the Hispano-Suiza motors in this country, followed Major Vincent and corroborated his statement that the Liberty motor was best adapted to American production. "It will answer for all the requirements of the war," he said, "and after the war will be a factor in the remaking of the whole automotive industry. We have to begin to think now of what we are going to do after the war is over."

The first speaker of the afternoon was Colonel



Mr. Augustus Post is another of those early pioneers in the automobile game, who bought cars and contributed to the support of the aeronautic industry in the early days, when automobiles were not yet useful. Then he turned to aeronautics and had enough adventures to fill several books. He was aide to Mr. Hawley in that memorable trip from St. Louis to the wilds of Canada



Steam-roller Manly, worked with Langley, still going strong



J. E. Diamond's sparkling wit was in evidence



A. Ludlow Clayden, of Class Journal fame, and then some



Major B. D. Gray, who is seeing that Uncle Sam is getting the material he pays for

V. F. Clark, head of the section of experiment and design of the Army Aviation Service. He presented the general problems of aerial warfare as they are presented to American aviators and manufacturers today, and asserted that if America got sufficient aerial superiority to send out a fleet of 500 bombing machines to destroy German lines of communication there would not be much left of the war.

Five papers were scheduled on "reasons behind the United States war truck designs," but on account of lack of time the only one read was a study of the chassis of the new Liberty truck by Cornelius T. Myers of Detroit. Reasons for particulars of the designs were given in considerable technical detail, and it was asserted that the new truck, particularly in the heavy size, rated as three-ton by the Government but equivalent to the commercial five-ton truck, was not only better for war purposes than any other truck in use but would be of great commercial value for heavy hauling after the war.

The Automotive Industries Banquet

The convention of the Society of Automotive Engineers closed with an automotive industries dinner at the Biltmore, at which Howard E. Coffin, Chairman of the Aircraft Board, was the chief speaker. He outlined the aircraft program of America and told of the progress made so far, after repeating certain criticisms widely spread. One of these dealt with an alleged shortage of mechanicians. Regarding this, Mr. Coffin said that while he could not give figures he could give his personal assurance that there was no shortage of personnel.

Mr. Coffin made the following statements in reviewing the aircraft production program:

July 24, 1917, the date of the President's approval of the aircraft act, providing for the creation of the United States Military Air Service and providing $640,000,000 for its maintenance, marks the real beginning of aircraft history in this country.

About half of this amount appropriated was provided for the purchase of aircraft, of aircraft armament and equipment, and the remainder for the building up and maintenance of an air service personnel greater than that of our entire standing Army of a few months before.

At about this same time also our close contact with the allied air services was established through a strong military, technical, and industrial mission of more than 100 men sent to Europe. As a result of conference the policy of aircraft development mapped out for this country at that time was seven fold.

The American Aircraft Program

This policy remains practically unchanged, and is as follows:

1. The United States to establish and maintain a great system of training stations, adequate both in ground schools and flying schools, to provide preliminary training for the personnel schedule.

Twenty-four great training stations were authorized under the bill to be built in accordance with the requirements scheduled in the air-service program. Nine grounds for the preliminary training of the flying personnel in technical matters were planned at nationally known universities. Both lines of work have been completed in accordance with schedule almost to a day. More than half of these training stations are already in full operation, and the others under construction in strict accordance with the general plan.

Standardization of Materials

2. To accomplish an international standardization in aircraft materials, in detail of design and types, and to achieve such co-ordination of effort as would concentrate the manufacturing facilities of the various allied countries upon the minimum number of types of those machines for which the producing equipment was best fitted.

International specifications for aircraft materials have been prepared under the direction



Caption eliminated by the editor

of the board by a committee representing the allied countries. A complete co-ordination of manufacturing facilities and policies has been agreed upon between the allied powers. Standardization in types, designs, and materials will continue to be carried forward under international agreement already in effect.

3. To construct primary training machines of quality and quantity approved by the Joint Army and Navy Technical Committee.

The production of standardized training machines approved by the Joint Army and Navy Committee will be in excess of the needs of the program by January 20. The production of these machines has been behind schedule because of the necessity for supplying training engines from this country to meet Canada's considerable requirements and because of the difficulties of a sudden increase of a manufacturing industry inadequate to the task.

4. To provide, equip, and train personnel for flyers and mechanics in accordance with schedule recommended by the Joint Army and Navy Technical Committee.

This program is progressing exactly on schedule. The training of both flyers and mechanics is provided for in this and in allied countries. Thousands of mechanics are being put into actual service with the allied forces. Trained men will be released as needed in the United States Air Service and their places kept filled with fresh material. Four of the northern flying schools near manufacturing centers have, in accordance with the training plans, been turned into mechanics' schools during the winter months. American flyers are in training in the United States and abroad and it is probable that the original program for pilots will be increased. The personnel for such increase is already available.

Supplying Finished Parts

5. To provide raw and semi-finished materials and finished parts, including motors, to insure the consummation of the augmented allied aircraft-building programs.

This has been and is being done. All of the allied nations are in considerable degree dependent upon materials and parts shipped from the United States. It is vitally important that the American aircraft program be not permitted to interrupt this flow of materials to the allies.

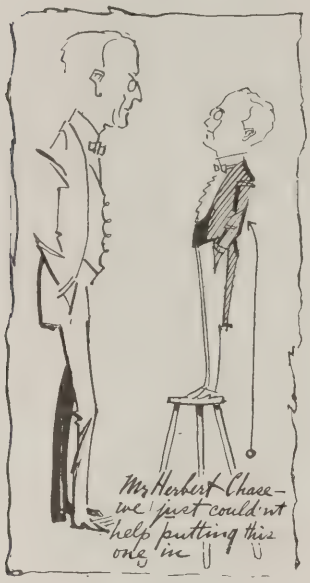
6. To provide for the equipment of the American forces in France for the period of January to June, 1918, in large part by purchase of fighting machines manufactured in allied countries, and to supply the machine tools and raw and semi-finished materials necessary to insure their production.

One of the first acts of the Aircraft Board after the passage of the appropriation bill in July was to authorize the placing by Gen. Pershing of orders for several thousand fighting machines in allied countries. This action was taken to insure adequate equipment of the American forces prior to June, 1918, in case of expected delays in manufacture and shipment of American made service planes. Many millions of dollars worth of materials and machine tools have been shipped from this country to aid this production.

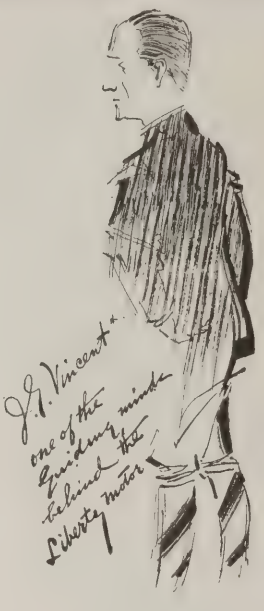
Completed Service Machines

7. To provide completed service machines, including combat and bombing types, for American need after July 1, 1918, and for such shipment of the finished product overseas as tonnage might permit.

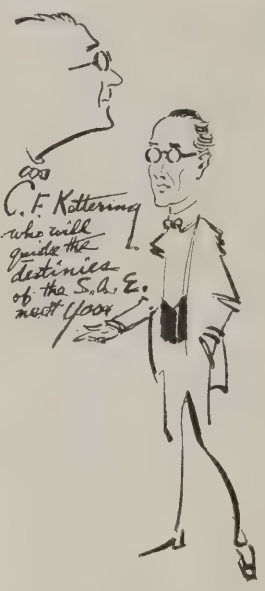
In accordance with the plans originally agreed upon with allied governments, it was deemed advisable to provide for advanced training overseas adjacent to the actual theater of military operations, but so energetic has been the work of the personnel division of the Signal Corps that the training facilities thus provided have been soon overcrowded, with resultant request that early arrangement for advanced training be made in America. To meet this change in program, delivery of advanced training planes will begin this month and within 90 days will have met requirements. The engines of foreign design for this advanced training schedule are already in quantity production in this country.



F. C. Diffin, the chairman of International Standards Board, and Herbert Chase discuss standards



Jesse G. Vincent was heard from on Liberty and similar subjects



C. F. Kettering will assume the S. A. E. crown in the summer



L. M. Bradley was delegate-at-large from the accessory manufacturers

Ratio of Men to Machines

In discussing the accomplishments of the air service in the consummation of the Army program, it will be well to point out the impossibility of certain proposals enthusiastically and persistently put forward by word of mouth and in the press. We have seen and heard much of the proposal of "100,000 aeroplanes" to be provided by the United States within the next year. In a country where one great industry produces a million and a half motor cars per year, the fabrication of a hundred thousand planes might seem easy, but actual figures based upon three years of practical experience in the war show that there are now between 40 and 50 men of the auxiliary services required for each active machine at the front. If this same ratio should be adhered to in our service, it would mean that some four million men would be required in our aeronautical department on foreign soil between our ports of debarkation and the fighting front.

Even though this number of men could be reduced by 50 per cent by increased efficiency and standardization the number required is still staggering. Consider, also, the overseas transportation problem as related to material only and without reference to personnel and its maintenance. The transportation of finished planes, properly crated, with the necessary spares, accessories, and equipment is in itself a serious problem, in view of the situation in ship tonnage.

Problem of Proper Housing

Again, the problem of proper housing behind the battle lines in Europe of such great numbers of planes as are carelessly discussed may well be left to sober thought.

Every policy in the development of the American Air Service has been decided upon recommendation of our technical advisers in daily consultation in allied countries, and under advice of an inter-allied staff of half a hundred experts assigned to our Air Service in the United States.

Every decision of the Aircraft Board has been based upon the military policies on the front. Daily cable communications with allied countries is maintained. The freest possible exchange of information, machine designs, and aircraft experts with foreign countries is in effect. Aeroplanes and engines of the very latest European development are going into production in the United States as quickly as, and perhaps more quickly and in greater quantities than, in allied countries. The feat of getting the 12-cylinder U. S. A. or so-called Liberty engine from the first scratch on paper in June to the beginning of production of quantity manufacturing tools in November is one never equaled even among the spectacular performances of the American motor-car business.

Promptness in Making Contracts

In June, from one to three weeks were required to deliver a properly authorized contract to a manufacturer after all details of the negotiation had been settled. Today, a few hours only are needed. The slowness of the Government departments in paying for the goods delivered has been a contractor's complaint of long standing. For 60 days past, in the disbursement of millions, no Signal Corps account properly presented has remained unpaid longer than one day after the delivery of the material.

Wherever facilities for manufacture have been offered which have seemed to promise reliable sources of supply in considerable quantity, investigation has been made by industrial experts to determine the value of these concerns in connection with the production program. Obviously, dependence for deliveries of the types of machines standardized by the War Department could only be placed upon large concerns amply financed and controlled by organizations familiar with the processes of duplicate quantity production.



A duty call prevented Captain Bob Bartlett from being there in person

Concentration of Effort

Since the passage of the aircraft bill in July, hundreds of concerns have asked for contracts to manufacture planes. Inasmuch as an organization of Government accountants, inspectors, and production men must be maintained in each plant engaged upon the aircraft program, the complication, expense, and general impossibility of splitting up the work among a multitude of small contractors, each capable of producing but a few machines, should be clear. The Government's best interest lay in safeguarding delivery in the most efficient way and at the lowest price, and required the building up of a nucleus of strong concerns to serve as the backbone of the aircraft program. Should the allied governments contemplate, as the war progresses, a further extension of American producing resources, there will be no difficulty in building up new sources of supply in every line of work.

The policy pursued by the War and Navy Departments, under direction of the board, has of necessity brought criticism from many quarters upon the part of small concerns or upon the part of those institutions unfitted because of location or of labor or other unsatisfactory conditions. Contracts have been requested upon the part of many concerns minus experience in the manufacture of such highly specialized goods and having not the slightest comprehension of the intricate ramifications involved in aeroplane and aeroplane motor construction.

Location of New Plants

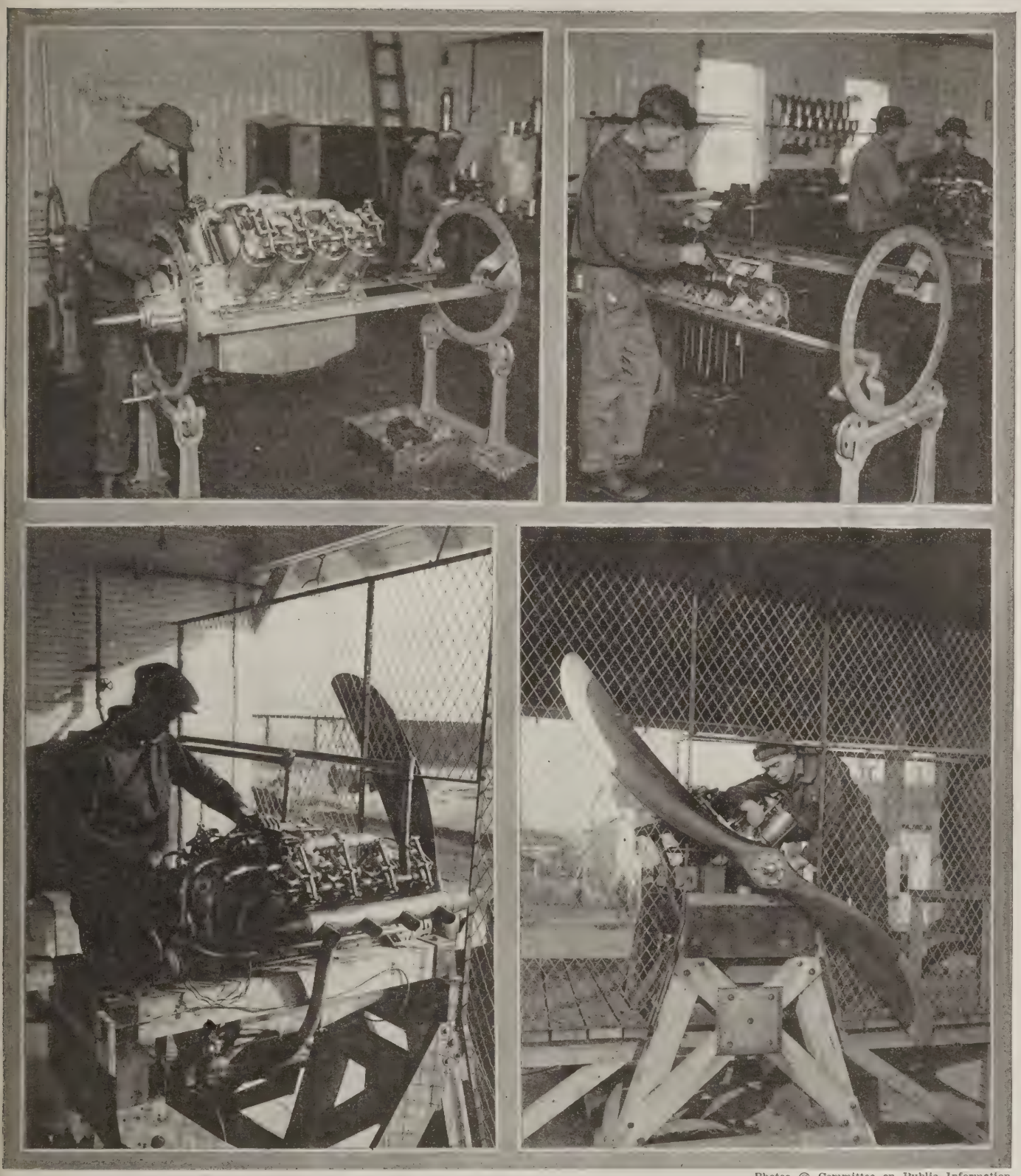
New sources of supply, flying fields, the experimental laboratory, and other activities under the direction of the board have been purposely located west of the Allegheny Mountains, in accordance with the stated policy of the military departments, to remove sources of war supply "200 miles from the seacoast" and to avoid the labor congestion which exsists in all eastern industrial centers. The reason for such a policy are too obvious to require comment.

Established plants of the motor-car industry are being largely utilized in the program of aircraft motor production, but automobile concerns are not being employed in aeroplane construction. In general, the statement may be made that not a single automobile factory is in any way involved in the plane-building industry. The reasons for utilizing the motor-building talent of the third largest of the world's industries permit no argument.

Joint Committee in Paris

There has been established in Paris under the direction of the Aircraft Board, a joint Army and Navy aircraft committee to coordinate the activities of Army and Navy in foreign territory and to form a direct channel of contact between the interallied aviation committee and the Aircraft Board in Washington.

The board has arranged with foreign Governments for a free interchange of manufacturing rights and patents governing aircraft for the duration of the war. Endless business negotiations with foreign private interests have thus been avoided and delays have been eliminated and the expenditure of many millions of dollars prevented.



Photos © Committee on Public Information

The final test of Curtiss aeroplane motor. Note the cage to protect the mechanic from the propeller. Every motor is tested to make certain it delivers its full power over long periods of time

Stearns to Make Rolls-Royce Aeroplane Engines.

The F. B. Stearns Co. has received a contract for the manufacture of aeroplane engine parts for the British Government. This is a sub-contract under the British Rolls-Royce Co. The contract will require several additions to the Stearns plant and a directors' meeting will be called this week to complete arrangements for enlargement. It is stated that though this contract will require some slight curtailment in the production of Stearns-Knight cars, their manufacture will be continued.

First Lieut. Neil Carothers, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Atlanta, Ga., and take station with the aviation examining board created under paragraph 81, Special Orders No. 204, War Department, September 1, 1917.

First Lieut. George V. Seibold, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from December 1, 1917.

First Lieut. August L. Grimme, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from December 1, 1917.

First Lieut. Rowland C. W. Blessley, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from December 1, 1917.

"La théorie en Aviation doit être enseignée non par des ingénieurs de laboratoire, mais par ceux qui ont conçu et realisé les meilleurs appareils, car, en Aviation, la théorie même tient encore de l'empirisme: elle est de l'empirisme scientifique" ROLAND GARROS.

AEROPLANE CONSTRUCTION IN GENERAL

Geometric Elements and Sections of the Wings

By OTTORINO POMILIO

(*Continued from page* 751)

COMING back to the shape of the wing it might be well to consider some of its geometric elements, *i. e.*, the lifting surface, the spread, the chord, the thickness. The lifting surface is expressed in sq. ft. The relations between the different dimensions of the wing is of special interest, particularly the ratio $\frac{l}{c}$ (where l = spread and c = chord) which is given the name of "aspect ratio," and the ratio $\frac{c}{s}$ (where c= chord and s = thickness).

Experience has shown that with a given lifting surface and up to a certain limit the wing efficiency increases with the aspect ratio. This is due to the fact that the front part of the wing surface and not the rear part is the zone where most of the lift takes place. This is true under normal conditions of flying, when the angle of incidence, which is the angle between the "line of flight" and the chord of the plane, is very small, 3° to 6°.

In landing this angle is increased to 15° or 20°. Under these conditions the rear part of the plane surface contributes much more to the lift, so that it might be convenient to have a wing of sufficient depth. In practice the aspect ratio varies from 4 to 8 or even 10. It is lower in monoplanes than it is in biplanes.

The ratio $\frac{c}{s}$ brings us to a discussion of the transverse wing section. We can immediately distinguish two large classes of wings. *Wings with a constant section and wings with a variable section.*

Wings of constant section are those generated by a section moving parallel to itself. These are found in the biplane type.

Variable section may vary as to:

(*a*) Dimensions only. This is true for some types of monoplanes, in which the wings are trapezoidal in shape. All sections are similar and constant in direction, the dimensions only changing.

(*b*) Dimensions and direction. All sections are similar, but the direction of the generating section varies as it moves farther away from the fuselage, so that we obtain a gradually decreasing angle of incidence which is larger at the fuselage than it is at the wing tips.

(*c*) Dimensions, direction and shape. This is true for the German Taube (pigeon) monoplane of the Etrich type.

The general section of the wing varies considerably according to the designer. Up till recently it has been determined by following sentimental whims rather than by abiding to experience in aerodynamics, *which should be the only teacher on the matter.* There is a *vast field open for research work.* Numerous experiments have already been made in different laboratories. These, however, with very few exceptions wre conducted so as to obtain a check on the properties and efficiency of wings already built, rather than as preliminary studies for guidance in the determination and adoption of the required section.

A classification of the various sections in use would be in itself a most difficult undertaking. The elements of a given section are many: The length or chord "*c*" the maximum depth or the thickness "*s*," the top curvature, the lower curvature, the camber, the leading edge, the trailing edge and so on.

It has been suggested to divide sections into two classes: Deep and shallow sections, basing the classification on the ratio $\frac{"c"}{s}$.

It is true that the higher the value of this ratio, the better the air penetrating qualities of the wing. Some designers divide sections into those having great curvature and those having a flat curvature, depending on the amount of camber. The point of view from which a given section is to be judged must be the efficiency of the wing itself, and certainly all of the above elements are factors contributing to that efficiency.

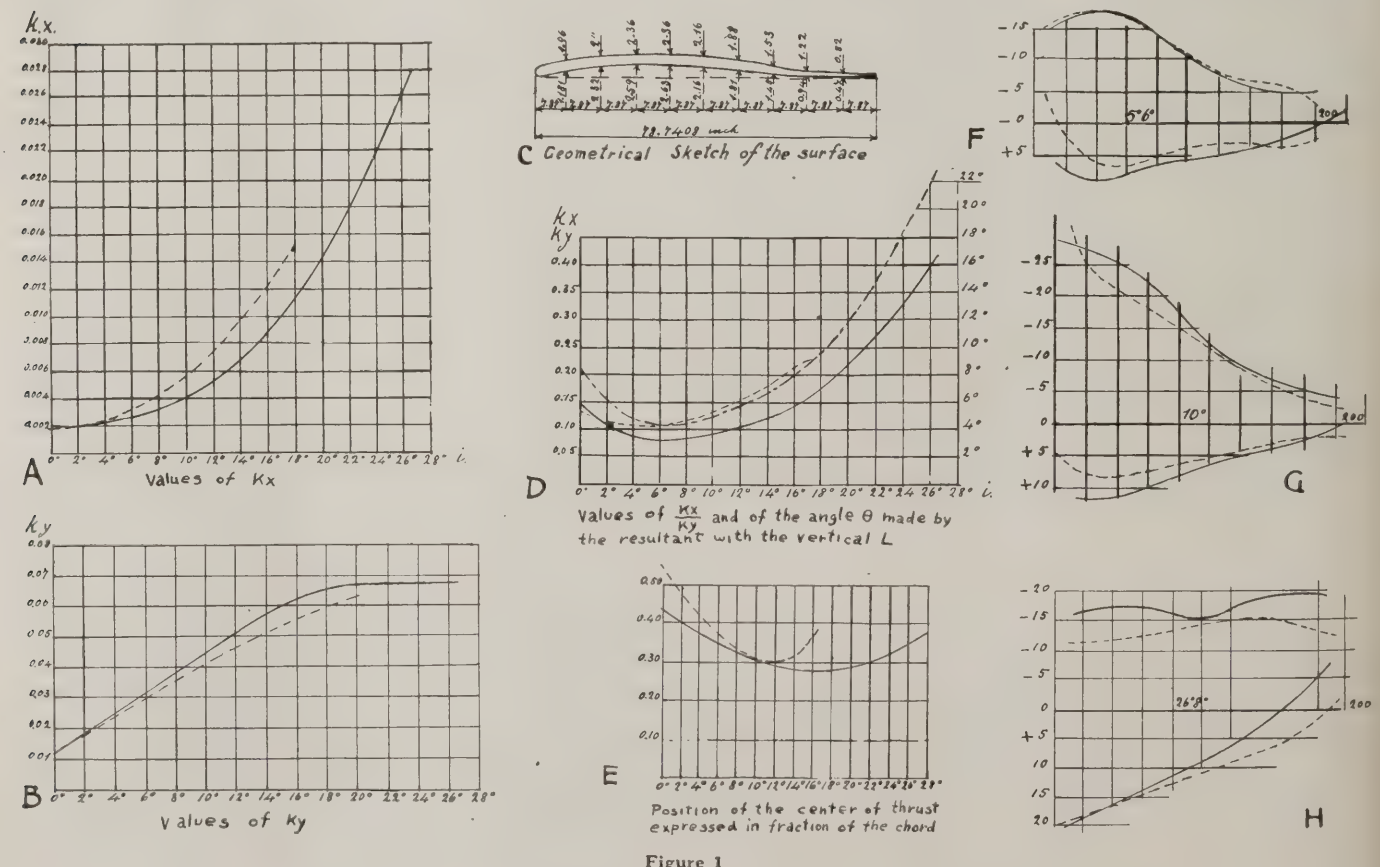


Figure 1

Efficiency or Value of Wing Curve

We will now discuss what is meant by wing efficiency. It has been shown that a wing moving through the air at a given angle of incidence "c" is subjected to a reaction R which has two components Q and S. "S" offers resistance to the forward motion of the wing and is known as drift. Q is the sustaining component, known as the lift. The ratio $\frac{Q}{S}$, *i. e.*, of lift to drift determines the efficiency or value of a wing curve. Experience shows that R is a function of the density of the air μ, of the wing surface S', of the velocity V and of the angle of incidence "i." Therefore, the lift and drift (Q & S) will also be functions of these quantities or

$$Q = K_1 \mu S^1 I^2 \phi$$
$$S = K_2 \mu S^1 V^2 \phi_2 \ (i)$$

The value substituted for μ is generally that at 32° F. and 30″ barometer, so that

$$Q = K_y S^1 V^2$$
$$S = K_x S^1 V^2$$

Where $K_y = K_1 \mu \phi_1 \ (i)$ $\qquad K_x = K_2 \mu \phi_2 \ (i)$

Then $\frac{Q}{S} = \frac{K_y}{K_x}$

Therefore, by supposing μ constant the study of a wing curve is reduced to the determination of curves for equations of K_y & K_x as functions of "i".

In Fig. 1 are shown a few experimental curves obtained for the wing section of the M. Farmantype, as determined by the "Institut Aerotechnique St. Cyr." We will give a brief discussion of these curves.

First, we notice the diagram which gives us the position of the center of pressure as function of the angle of incidence "i".

The center of pressure is defined as the point of intersection of the chord and of the resultant R of the air reactions acting on the wing.

We, then find curves of K_x, K_y, $\frac{K_x}{K_y}$ as functions or i. It is to be noticed at once that for $i = O$, $K_x \neq O$ & $K_y \neq O$. While K_x increases in value as a power of "i" greater than the first power, K_y increases in value as a linear equation and becomes constant at values of i between 18° and 22°. The ratio $\frac{K_x}{K_y}$ decreases up to a minimum for a value of "i" lying between 4° and 8° and then increases rapidly.

In other words the efficiency $\frac{K_y}{K_x} = \frac{Q}{S}$ increases to a maximum and then rapidly decreases. At a value of

$$i = 6° \ \frac{K_x}{K_y} = O \ .08, \ i.\ e., \ \frac{K_y}{K_x} = \frac{Q}{S} = 12.5$$

This means that in order to be able to lift 12.5 lbs. the M. Farman wing, at an angle of incidence "i" = 6°, must overcome a resistance or drift $s = 1$ lb. The maximum efficiency of a given wing is therefore found as corresponding to a well defined angle of incidence, called the "best angle of incidence." The problem confronting the designer is to *study all the elements of wing sections,* so as *to make the maximum value of wing efficiency as high as possible.* These elements are, as explained before, the top and lower curvature, the leading edge, the trailing wing zone, and the ration $\frac{c}{s}$, or or chord to maximum thickness of wing.

The top curvature of the wing is of enormous importance. We must remember that sustentation in the air is the result of two phenomena. One is the compression of the air against the lower face of the plane and the other is the formation of a partial vacuum on the upper surface of the plane. Coming back to Fig. 1, we find there, for a few values of "i" (4°; 5° 6′; 10°; 14° 3′; 18° 45′; 22° 8′; 26° 8′); distribution diagrams of the pressures and vacuums occurring along the whole depth of wing. It can readily be seen how much more this vacuum helps the lift than the actual increase in the air pressure below. This fact points out to us the advisability *of paying more attention to the study of the upper curve of the plane, as being more important than the lower or concave side of a plane.* The convex side of the plane should be so curved as to produce the highest vacuum possible without subjecting the machine to jerky lifts. Its curvature near the leading edge should be designed on a theoretical basis following the criterions adopted in the design of a turbine runner blade.

The design of the leading edge is also important. One inventor has proposed to give it a special shape like a beak, so as to cut through the air with a minimum air disturbance and without shocks. Experiments conducted on this basis have not given satisfactory results.

The under side of the plane is generally slightly concave. High speed machines have very flat wing curves.

We have already seen the importance of the ratio $\frac{c}{s}$, as affecting the air penetration qualities of the wing and the wing efficiency. The thickness of wing s depends on the depth of the longerons. In biplanes it is easier to adopt longerons of shallow depth. In monoplanes, this cannot be carried very far because the strength of the spars would be decreased so as to require an increase in the system of bracing.

This increases the head resistance considerably, so that we lose in one direction the advantage gained in the other.

We will now discuss the trailing edge or zone of the wing. From this standpoint wings may be divided into two classes.

1. Simple curved wings.
2. Double or reverse curved wings.

In Fig. 2 are shown diagrammatically, two of these types.

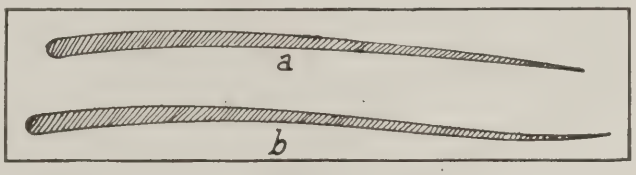


Figure 2

In simple curved wings the centres of curvature of the trailing zone are below the wing. In reverse curved wings these centers of curvature are above the wing. Wings of the latter type have some advantages. The most important of these are as follows: First, the variation in the position of the center of pressure with the change in the angle of incidence is not as great as in simple curved wings. Secondly, due to the difference in pressure between the upper and under sides of the wing, serious air disturbances are set up (air rushing in from above) which absorbs energy and reduces the efficiency of the wing. The reverse curve tends to decrease the difference in pressure, by diminishing at the trailing edge, both the vacuum developed on top of the wing and the increase in pressure developed below the wing.

Some designers make the trailing zone flexible (Bréguet, Caudron). This gives the wing all the good qualities of a reverse curve with the added advantage, that due to its flexibilty, the wing offers less resistance to violent wind-gusts and is therefore not subject to high abonormal stresses. Naturally, the design of a flexible wing is rather complicated.

Unit Lift—If S' = total wing surface in sq. ft.
P = total weight lifted in lbs.

Then the unit lift $= \frac{P}{S'}$ in lbs./sq. ft.

But $P = Q = K_y S' V^2$

$$\therefore \frac{P}{S'} = K_y V^2$$

Increasing the velocity V will increase the unit lift indefinitely, and the power required will also increase indefinitely. There was a time during the development of the heavier than air machines in which it was thought that the most important progress to be made consisted in increasing the unit lifting capacity of the wings.

In nature we find that the unit lift varies from 0.022 lbs./sq. ft (for butterflies etc.), to 1.23 or 1.44 lbs. per sq. ft. (for the condor, albatros, etc.). In aeronautics the first unit loads were 2.00 lbs./sq. ft. (Wright), 3.0 to 4.0 lbs./sq. ft. (Farman) and then were increased to 5 or 6 lbs./sq. ft. (Bleriot), 7 or 8 lbs./sq. ft. (Nieuport) and 12 lbs./sq. ft. (Deperdussin and Ponnier of the Gordon Bennett, 1913). Experience has shown that with the efficiency of wing now obtainable in order that an aeroplane may be practical especially for landing on difficult ground, the unit lift should not be over 5 to 6 lbs./sq. ft. In general, *the lower the unit lift the easier it is to control the machine, thereby increasing the safety of flight.*

(*To be continued*)

THE 200 H. P. PEUGEOT AVIATION MOTOR

By E. H. SHERBONDY

THE 200 horse-power Peugeot Aviation Motor is of particular interest to American engineers because of the remarkably successful racing cars which have been constructed by the Peugeot Company for four years prior to the war. The various sizes of these motors are given in the following table:

Four-cylinder Peugeot Racing Motors:

	Bore	*Stroke*
No. 1.....	115 mm.	200 mm.
No. 2.....	100 "	180 "
No. 3.....	92 "	169 "
No. 4.....	80 "	160 "

All of these motors, excepting the No. 1, were built with the same characteristics, comprising 4 cylinders, cast en bloc, with 4 overhead inclined valves per cylinder, operated by two cam shafts. The cam shafts were carried in two aluminum cases which were separated from the cylinders by means of steel shouldered studs. At the forward end of the engine there was a train of spur gears connecting the cam shafts to the crank shaft. Each of these gears was mounted on a double row annular ball bearing. The crank cases were of the barrel type and the crank shaft was supported on three annular ball bearings. The pistons were machined out of solid steel bars and were drilled for lightness. With the development of these motors came the dry sump lubrication system, which has since been widely copied by many manufacturers of racing automobile motors and aviation motors. These Peugeot motors were the first European engines to give high specific power (that is mean effective pressures of over 110 pounds per square inch).

Owing to the remarkable success of these motors in road and track races, it was assumed that the design would afford an excellent foundation for an aviation motor. This, however, proved to be only partially true, and a long series of experiments were carried out before the Peugeot Company had built an aviation motor which was able to hold its power and to avoid mechanical troubles during a 50-hour run. The design here below described is the result of this work.

Cylinders.—In Fig. 1 is illustrated a longitudinal section through the Peugeot cylinder block and cam shaft casing. Four cylinders of 100 mm. bore and 180 mm. stroke are cast en bloc with the water jacket. Large core openings are arranged at either side and at both ends of the block which are closed by means of aluminum plates screwed to cylinder jacket. Four valves per cylinder are used, as was common to Peugeot racing car distribution. The valves have a port diameter of

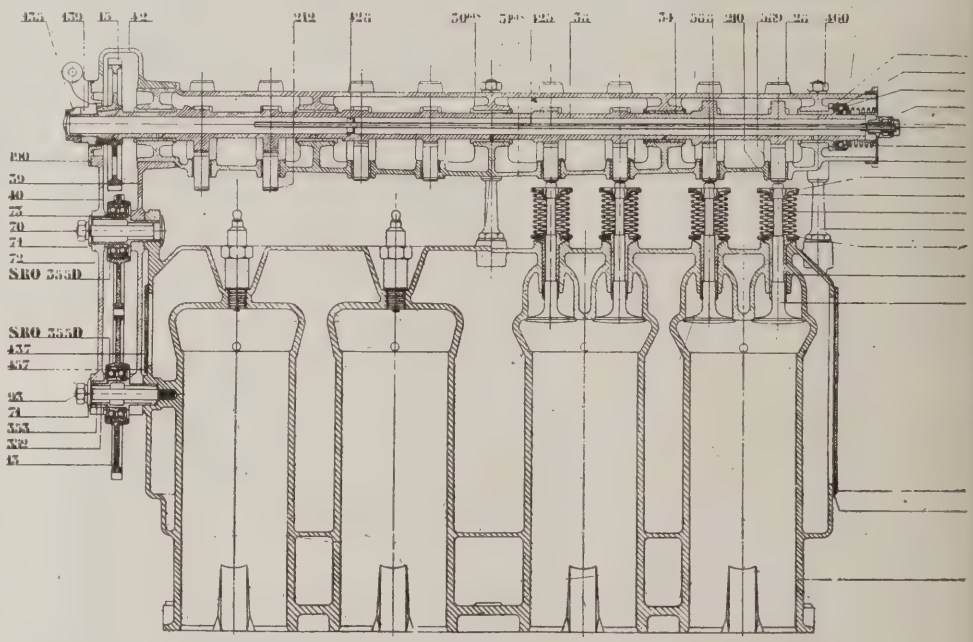


Fig. 1

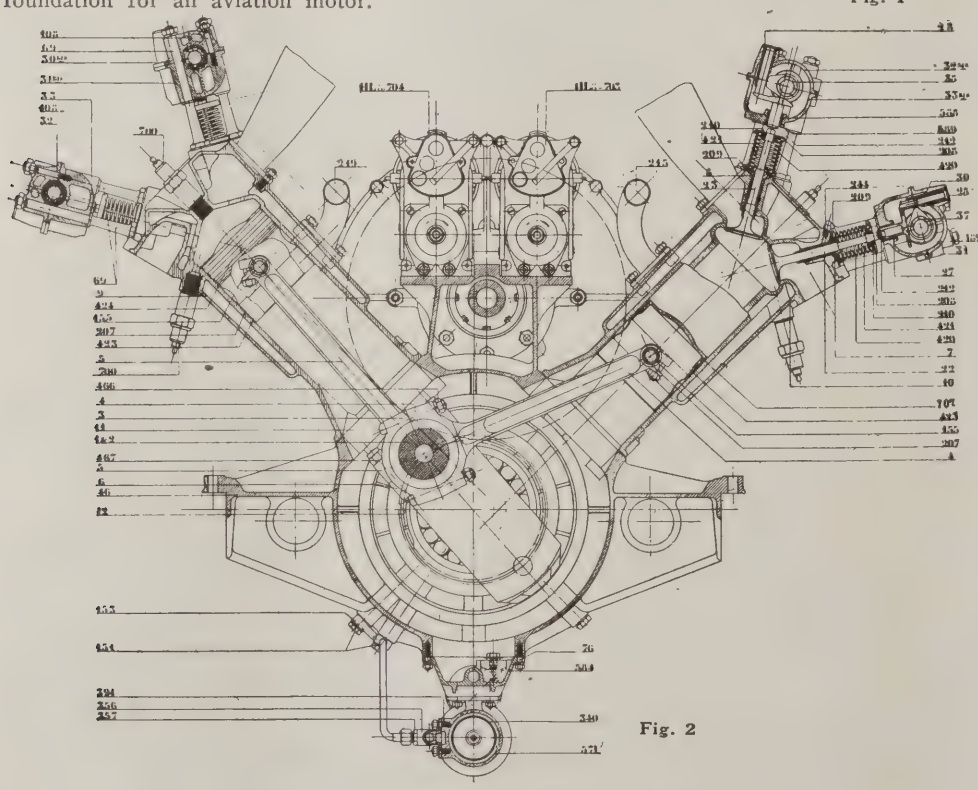


Fig. 2

44 mm. and an outside diameter of 48 mm. In the racing car motor of the same size, the inlet valves were somewhat larger than the exhaust, namely, 52 mm. in diameter. The combustion chambers of this cylinder are not machined. The valves have stems of three diameters, the lower portion next to the valve head being 12 mm. in diameter. The main guide portion of the valve is 10 mm. in diameter, and the upper end of the valve stem is reduced to 8 mm. The valves operate in bronze guide bushings which are pressed into the cylinder. Two springs per valve have been found indispensable to satisfactory valve operation for high speed motors, the inner or secondary spring having a different period of vibration from the outer spring.

Pistons and Connecting Rods.—Fig. 2 is a transverse section through the motor. The pistons are 100 mm. in diameter and 90 mm. long, and are machined from solid forgings. Each piston carries two rings. The center portion of the piston head is globular in form and has a thickness of 4 mm. Below the ring grooves the thickness of the skirt is reduced to one mm. The waist of the piston about the piston bosses

is reduced in diameter to avoid difficulties through expansion and distortion at this point. The piston pin bosses carry bronze bushings. The piston pin has an outside diameter of 21 mm. and a hole drilled straight through of 14 mm. These pins are lubricated by spray thrown off by the big ends of the connecting rods. They are clamped into the top end of the rod and oscillate in the piston pin bushings. The connecting rods are of the forked type and are machined out of B N D steel. The shank of the rod is an I-beam section; the flange and web having a thickness of 2 mm. The center connecting rod big end is finned to assist in cooling the big ends. Big end bushings are babbit lined bronze shells. Connecting rod centers are 295 mm., giving a connecting rod to stroke ratio of 1.64 to 1. The crank shaft is mounted in three large double row ball bearings, which in turn are seated in bronze cases, retained in the crank case by means of long cap screws and spring washers. The crank shaft is made in two sections fitted together at the center main bearing by means of a taper, key and retaining nut. This construction is necessitated by the use of a ball bearing in the center of the crank shaft. At the rear end of the crank shaft there is keyed onto a taper, a reduction gear pinion having a face 55 mm. wide and approximately 170 mm. pitch diameter. The oil is carried from the ball bearings to the crank pins by means of pressed brass banjo-drums, and thence through channels drilled in the crank pins. At the forward end of the crankshaft there is mounted a spiral pinion for driving the oil pump, and a hand starting reduction gear and starting magneto gear. A train of spur gears, illustrated in Fig. 3, is also arranged at the forward end of the motor for driving the cam shafts, magnetos and water pump. This train of gears is driven from a master pinion mounted on an extension of the propeller shaft whose axis is in the plane with the crank shaft and immediately above it in the crank case. The propeller shaft reduction gear is mounted in two annular ball bearings, one of them a double row bearing. These bearings are spaced about 350 mm. apart. There is also provided a double ball

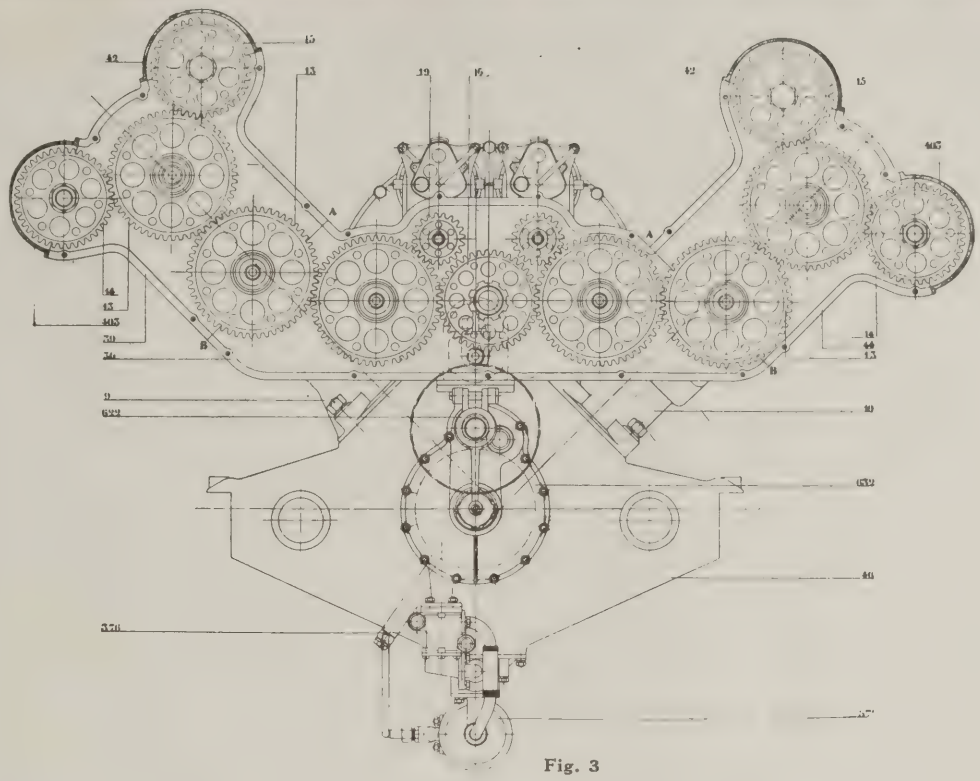


Fig. 3

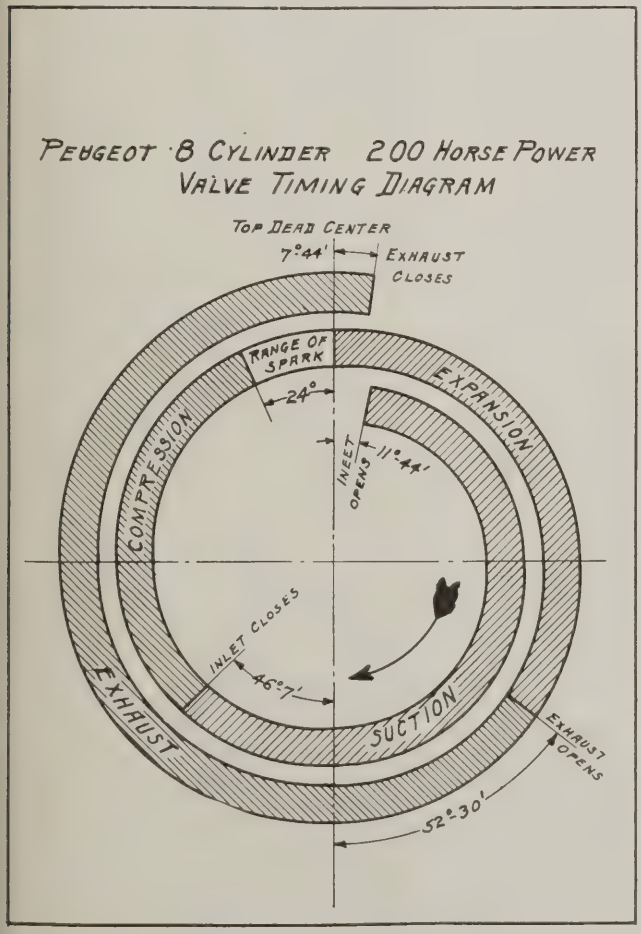


Fig. 4

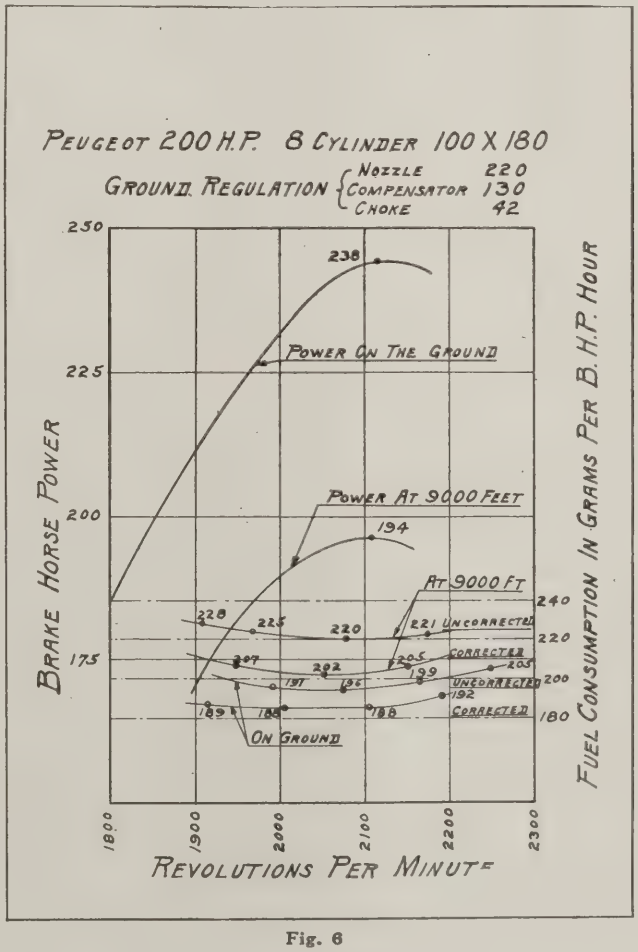


Fig. 6

thrust bearing to take the propeller thrust. The propeller shaft has a hole 25 mm. in diameter drilled through its entire length.

Lubrication.—The lubricating system, as before stated, is the dry sump variety, of which the Peugeot Company was the originator. The oil is drawn off from the base by means of a double gear pump. After having been filtered and cooled in an oil radiator it is pumped to the main ball bearings and various auxiliary shafts. Oil is led to the centers of the hollow camshaft and is distributed under pressure to the camshaft bearings. After passing through the camshaft housing the oil is returned to the crank chamber via forward end timing gear housing.

Valve Operating Gear.—The cam operate the valves by means of intermediary push rods which are of different form for the inlet and exhaust valves. The camshafts are offset 3 mm. from the valve axis. A very complete idea of the valve arrangement and operation may be had by referring to figure 2. The valve timing, illustrated by Fig. 4, is quite conventional; the inlet valve opening at 11 degrees and 44 min. after the top dead center, equivalent to 3 mm. of piston travel, and closing at 46 degrees and 7 minutes after the bottom dead center, equivalent to 21 mm. of pison travel. The exhaust valves open at 52 degrees and 30 minutes before the bottom dead center, equivalent to 26 mm. of piston travel, and close at 7 degrees and 44 minutes after the top dead center, equivalent to 1½ mm. of piston travel. There is one mm. clearance between the inlet push rods and valve stems. There is ½ mm. clearance between the exhaust push rods and valve stems. The inlet valve camshaft has 8 integral cams. The exhaust valve camshaft has 16 cams; 8 of these being half compression cams which are put into operation by longitudinally displacing the camshafts in their bearings. The camshaft driving gears are retained on the camshaft be means of a taper, key and retaining nut construction.

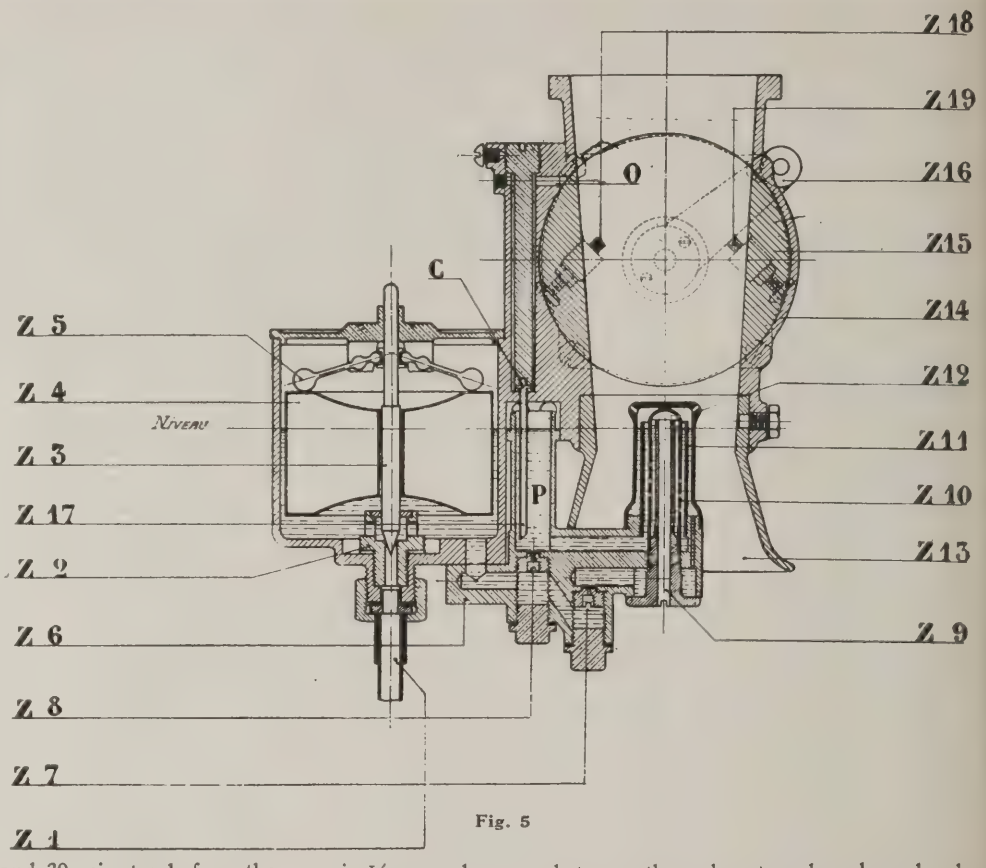


Fig. 5

Exhaust Collector.—Light steel manifolds serves to connect the 8 exhaust ports of each of the cylinders to the central expansion chamber which has a stack at its rear portion inclined at an angle of 25 degrees from vertical so as to discharge the exhaust above the upper wing of the plane.

Carburetors.—Each group of four cylinders is fed by a single carburetor. The carburetors are similarly disposed on the right and left sides of the motor. These carburetors are a development from the earlier type of Claudel racing carburetor. The sectional drawing of this carburetor is to be seen in figure 5. The throttle is of the barrel type and is so machined as to form the diffusion portion of a venturi tube, and is highly efficient when operating under full open conditions. There are two main fuel passages to the jets; one feeding through the compensating plug to the well P, which supplies the necessary fuel during idling and acceleration, and a second calibrated plug which feeds the fuel for the main supply.

The inlet pipes are jacketed and are heated by means of exhaust gas. This no doubt is responsible in some degree for the remarkably low fuel consumption of this motor. The minimum reading is 188 grams per H.P., or which corresponds to a thermal efficiency of more than 30 per cent (on the brake H.P.).

Ignition.—The order of firing each group of cylinders is 1, 3, 4, 2. This particularly refers to the righ hand group of cylinders. The firing order of the left hand group of cylinders. is 5, 7, 8, 6. The entire firing order is as follows:

6 5 7 8
1 3 4 2

The ignition advance is 24 degrees crankshaft travel, which corresponds to 21 m. before the top dead center. Two SEV 8-cylinder magnetos are arranged for crossing firing.

In figure 6 the horsepower and fuel consumption curves of the Peugeot Aviation Motor are illustrated and in figure 7 is a comparison with the theoretical.

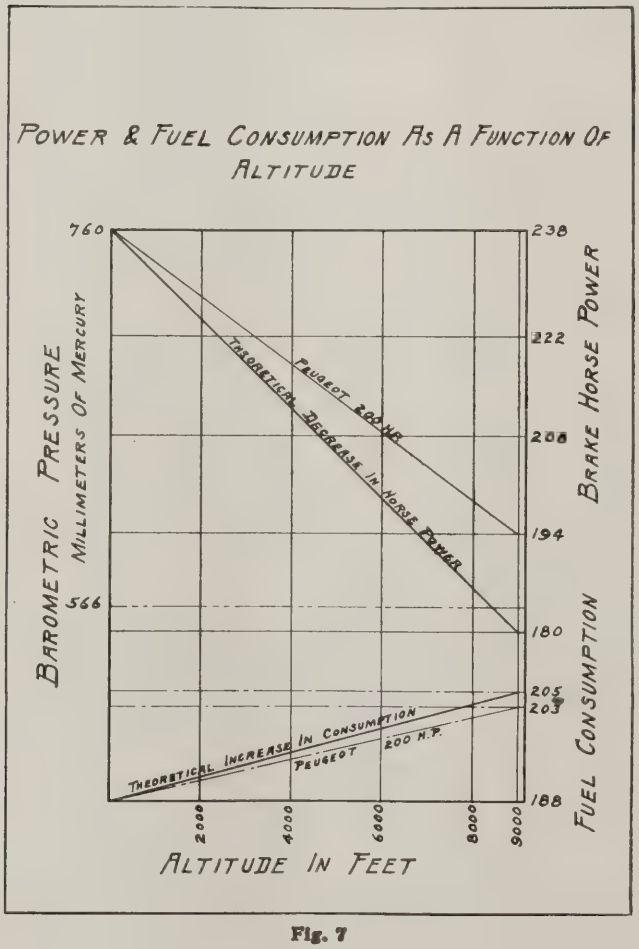


Fig. 7

FOREIGN NEWS

BELGIUM

Queen Elizabeth of Belgium, who is very active in her work for soldiers, uses an aeroplane almost exclusively for transportation. She often takes flights over enemy lines and on one occasion shrapnel from anti-aircraft guns damaged the wings of her machine so badly that the aviator experienced difficulty in making a successful landing.

BRAZIL

The first contingent of Brazilian naval aviators have left for England, according to a news dispatch. They form the first contribution of Brazil to the Allied fighting forces in Europe.

CUBA

Lieut. S. G. Camperzano, who is now in Havana assisting in the training of the Cuban Escadrille, which will shortly take its place on the battle line, has received a medal for conspicuous bravery from the French Army.

FRANCE

In reporting operations on the Balkan front on January 7th, the French official announcement states that enemy aviators bombarded towns along the Vardar and north of Monastir several times.

The French official report for January 8th reports successful bombing work as follows:

"On Sunday French pilots brought down or severely damaged six German aeroplanes. French bombarding squadrons carried out several operations on Saturday night. Chemical works at Ludwigshafen, railway stations at Fribourg-en-Brisgau, the aviation ground at Neubreisach, and factories at Rombach, Maizieres and Hagondange were bombed with many projectiles."

The French official report for January 11th announces that two German aeroplanes were brought down in aerial combat.

Reporting on activities on the Balkan front, a French statement issued on January 11 states that French aviators bombarded enemy encampments and concentrations northeast of Doiran and in the region of Monastir.

The French official report issued on January 13 summarizing the activities of the French air service from January 1 to January 10, states that fifteen enemy planes were destroyed. The statement follows:

"In addition to the fifteen German aeroplanes and one captive balloon previously reported as having been destroyed between January 1 and January 10, French pilots brought down in the enemy lines twelve machines which probably were destroyed, although it was not possible to confirm this."

A memorial of James A. McConnell, the Carthage (N. C.) boy of the Lafayette Escadrille who was killed in action on the French front last spring, has been erected by citizens of Ham, the small French town near which the American fell in flames.

The town opened a subscription for a monument to the aviator.

GERMANY

On January 4 and 5 German aviators brought down fifteen Allied aeroplanes and four captive balloons, some of which were winged by anti-aircraft gunners, the Berlin communiqué reports.

The German official statement issued January 10 summarizes Germany's aerial activities as follows:

"In December the enemy losses in aircraft on the German front amounted to nine captive balloons and 119 aeroplanes, of which 47 dropped behind our lines. The rest were observed to fall behind the enemy's positions. We have lost in battle 82 aeroplanes and two captive balloons."

The German official announcement for January 13 reports several aerial victories, as follows:

"There were numerous aerial encounters yesterday. Six enemy aeroplanes and three balloons were shot down."

A German news agency reports that Entente aviators made thirteen air raids on Germany in December, six on industrial districts of Lorraine and Luxemburg and seven on Freigburg, Baden, Mannheim, Saarbrucken and Zweibrucken. The Germans state that the results were insignificant, excepting in one case, where there was a temporary interruption of operations at an iron works, caused by the dropping of a bomb on a gas tank. Seven persons were killed and thirty-one injured, including several prisoners of war, in the course of these raids.

Captain Baron von Richthofen, after an absence of over two months, has returned to active service. He is credited with sixty-two victories.

GREAT BRITAIN

The British official report for January 5 reports further bombing activity on a large scale, which resulted in several successful hits.

"More than 250 bombs were dropped yesterday on Denain, Ledeghem and the Menin-Roulers railway stations. Eight hostile machines were downed during combats in the air and two others were driven down out of control. Five of our machines are missing.

"During the night our machines attempted once more to bomb factories and railway communications at Mezieres-Lesmetz, and several pilots succeeded in dropping bombs on their objectives."

The British official communication dealing with aviation issued on January 7 says:

"Twelve thousand rounds were fired Sunday from machine guns at hostile troops, transports and other targets, and nearly three tons of bombs were dropped on different objectives.

"Six hostile machines were downed in air fighting and two others driven down out of control. One of our machines is missing."

A special aviation report was issued on January 11, announcing a bombing raid against enemy ammunition depots, as follows:

"Nearly two tons of bombs were dropped Thursday on an ammunition depot in the vicinity of Courtrai and other targets.

"One enemy machine was driven down out of control. One of our machines is missing."

The official statement issued on January 11 contains the following paragraph:

"Four hostile machines were downed in air fighting and two others driven down out of control. Three of our machines are missing."

It was announced on January 13 that British aeroplanes bombed the Cestova railway station, on the Balkan front.

The aeroplane output of Great Britain is again suffering from the handicap of a strike. The Sheet Metal Workers' Society objected to the policy which has had such excellent results in securing increased output from unskilled workers—that of 'diluting' labor. The workers complain that 20 per cent of their numbers have been drafted—a figure which, outside of the union, is considered very reasonable and gives no ground for complaint. The protest of the workers was, nevertheless, submitted by the manufacturers to the Chief Industrial Commissioners for arbitration and he, of course, decided against the workers. A strike ensued and production in the Midland district, including the works at Birmingham, Coventry and Woolverhampton has been completely stopped so far as sheet metal work is concerned. The *Daily Mail* correspondent writes that the strikers received a minimum 55s. 6d. for 54 hours work a week and that the best of them were employed in the manufacture of radiators at £5 per week. It is evident that they know that aeroplane supremacy can be endangered by reducing production, and they are taking every advantage of their position.

A dispatch to Reuter's from British headquarters says the Germans are experiencing difficulty in maintaining efficiency in their air service on the Western front.

The correspondent says prisoners are unanimous in saying that the output of new machines is very limited, and that this fact is compelling the employment of old types of aircraft.

ITALY

In order to prevent any further raids by enemy aircraft against Padua, a flying cordon of daring Italian aviators was massed around the city on the night of January 5. A fleet of German bombing and fighting machines went to attack, but upon being met by such a formidable force, diverted their course and bombed Mestre, Bassano and Castelfranco, causing considerable damage and heavy loss of life.

The Italian official report for January 11 states:

"Atmospheric conditions were favorable to aerial activity. Three enemy machines were brought down, one of these by British airmen."

A statement was issued on January 11, outlining the activities of British aviators on the Italian front. It was announced that British aeroplanes attacked a squadron of seven enemy planes and succeeded in bringing down four of them. The British came out of the fight with all of their machines intact.

Further aerial successes are reported in the Italian announcement of January 13, as follows:

"Italian acroplanes dropped one and one-half tons of explosives on enemy magazines and encampments, and brought down two enemy machines. British airmen brought down one enemy aeroplane."

An Associated Press dispatch received on January 13 states that Italian aviators carried out a successful bombing expedition against Primolano, an important railway terminus constituting the enemy's lines of communication for troop supplies to the fighting front. Two tons of bombs were dropped on extensive storehouses and encampments around the terminus and caused serious damage, further interrupting the enemy's lines of communication, already seriously affected by the mountain snows.

British aviators on the northern Italian front, in the course of the past week, destroyed eight Austro-German machines and forced two others to the ground, the British war office announced.

The British in these aerial engagements lost only one aeroplane.

The official report issued on January 5 reports great aerial activity on the Italian front:

"British airmen destroyed a hostile captive balloon and brought down an aeroplane. By day and night there is considerable aerial activity on the front lines and in the rear areas. Our airmen bombarded, with good results, enemy encampments and aviation camps. The station at Levico and adjacent magazines were bombarded with 1,200 kilograms of projectiles. Enemy aircraft dropped bombs on Mestre, Bassano and Castelfranco. Slight damage and some casualties resulted."

The Italian official report issued on January 12 reports the destruction of five enemy planes, as follows:

"Four enemy aeroplanes were brought down by British airmen. A fifth machine, hit by our airmen, fell in flames near Usiana. Our machines bombed with visible results military establishments in the Sugana Valley."

JAPAN

During the annual army manoeuvers held in Japan this year, there was a decided increase in the importance attached to the work of the air force. Although comparatively few machines were mobilized, very active use was made of them. Problems of transportation were very carefully worked on according to German methods and much larger bodies of troops mobilized heretofore.

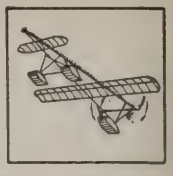
SWITZERLAND

A new German aeroplane, flying from Strassburg to Lorraine, lost its way and, being fired on by Swiss troops, guarding her neutrality, landed near the frontier and its crew was interned.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

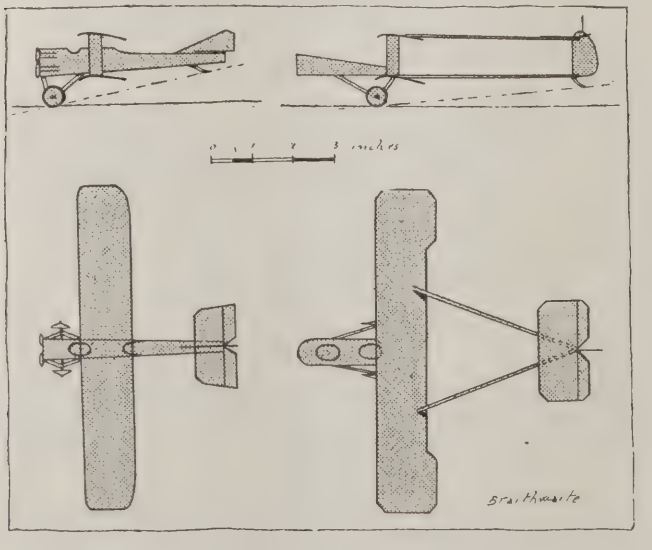
Paper Models in Australia

The notes on the making of paper models which have appeared in these columns from time to time have led to some work being done in this direction in Australia, as the following letter from Mr. M. A. Braithwaite, of Melbourne, indicates:

"I read your articles on paper models with much interest, as I have, together with the assistance of a friend, Mr. W. B. Kirkland, been building a number of machines of the type advocated, and although they are not actually scale models of any particular machine, they are proportioned as near as possible without being actually to scale. I am enclosing the drawings of two of our manufactures.

"As will be seen one of the machines is of Farman design, and although this model is slightly too heavy to be much of a flyer it does some good glides at odd times. The tail booms are made of paper rolled into a cylinder. The chassis of this and all the machines are constructed in the same manner, and are remarkably strong.

"In building the models we use no other material than paper, except that a portion of a match is used for the axles, while the wheels run on stub axles of pins pushed into the match. The wheels themselves are made from visiting cards and are disc. The models are all weighted in front with brass paper pasteners, the planes are cambered and usually of eight inches span. As regards actual flying they are decidedly graceful in appearance and very real in their actions, especially when they land and taxi along the ground. The gliding angle is 1 in 5-6. This is rather steep, but as one can rarely get a long flight indoors it does not much matter. In flight they carry out all manner of evolutions and stunts, and by throwing them straight up to a height of ten feet they perform a loop of two feet six inches or three feet in diameter, and upon recovering from the dive fly off as if they were actually under control."



One of Mr. Kirkland's paper models

A Steam Power Plant for Model Aeroplanes

(*Continued from Page* 756)

When the plant is on test, the perforated asbestos, casing is placed around the coils and the burner opened wide so as to allow the flame to extend the entire length of the coils. After the first flash of steam reaches the engine, it is time to keep clear of the propeller, as it will speed up very rapidly. It would probably be disastrous to the engine to allow it to run lights on the flash boiler at full pressure, when 60 pounds per square inch will spin it up to 3500 revolutions per minute.

It is very necessary that the engine be lubricated continuously, otherwise the high temperature of the steam would soon cause it to run dry and seize. This is accomplished by a gravity oiler in the steam line shown in Fig. 1, between the engine and boiler. There are two pipe connections to the reservoir, one of which serves to equalize the pressure on the oil and the other as the feeder outlet. A small pointed screw is fitted in the outlet in order to regulate the rate at which the oil drops into the steam line. This adjustment is made through the filling hole at the top of the reservoir.

It is hoped that the above remarks will be of interest and benefit to the model aeroist, as this particular plant is the result of considerable experimenting, especially toward the development of a light and efficient steam generator. While there is yet considerable scope for experimental work to obtain the ultimate in a small power unit the writer believes the flash steam plant to have more possibilities than any other type.

The Correspondence Model Aero Club

The Correspondence Model Aero Club has now an addition to their staff of officers. Mr. Edwin A. Jenkins, of 1141 Bushwick Ave., Brooklyn, N. Y., was chosen Membership Secretary. As the club is carrying on a vigorous campaign for members, it is expected that an increase of applications will soon be noticeable. Mr. Jenkins will hereafter take care of all of this club's correspondence relating to membership. Individuals, therefore who wish to become members of this interesting and progressive club are requested to write at once to Mr. Jenkins for further information.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Hun Air Raiders Help the Golfers

So often has it been remarked that the English have no sense of humor that the saying has become almost a platitude. However, if there is really anything in it at all it now appears than an exception must needs be made in the case of the golfing element, who in the air raids that are made almost daily by the Kaiser's aviators appear to have tapped a veritable fountain of fun.

Babies are not the only target of the Hun raiders. When balked of what is to them legitimate prey or driven away by the English pursuit machines and defensive guns, the Kaiser's men turn to the golf courses, where they drop a few bombs and then turn away toward the Rhine to report to their war lords the success of their enterprise and to give details to the German public of how another section of London has been laid in ruins or other damage done of military importance.

To the average American these raids would appear to contain little or none of a humorous nature, even when the target happens to be a golf course, but instead of tearing out their hair in large bunches and foaming at the mouth when another fine putting green is turned into a yawning pit the English knights of the brassie and the cleek make the best of matters and extract as much satisfaction and excitement from discovering and charting the hits as they would in a contest with Colonel Bogie. It is said that the golfers can scarcely wait for the dawn to start out upon their work of exploration. No prize is given for the one who discovers the most craters, but instead those who are first on the scene are allowed to mark and name these, and this is considered compensation enough.

It apears that this little game has been going on for something like two years, one club which had its course bombed by a Zeppelin having set the fashion by adopting the two cavities that resulted as bunkers and by altering the layout of the round to suit. As one of the pits was large and the other small they were named, respectively, "Big Willie" and "Little Willie."

So far the putting greens have suffered but little and the English enthusiasts are hoping that their luck will continue to hold. Occasionally a teeing ground is blown completely off the map, but this does not matter so very much. During a raid one course well known to many Americans had a teeing ground blown to smithereens by a bomb dropped from a frustrated Gotha machine on its way back home. Was there a man dismayed? Not a bit. As soon as the raider had passed away into the blue the green committee made an inspection and decided that they would build a new tee further back and use the cavity as a bunker for topped drives.

Noon Tryst

Droning, he comes, through the white, still air
  At the nooning hour of day;
I signal him welcome, I breathe him a prayer,
  —My lover comes, winging his way!

Weaving in spirals, he sweeps and dips,
  —Oh, stolen, sweet hour, stay!
There are smiles in his eyes, and love on his lips,
  Shall I say to my bird-lover, nay?

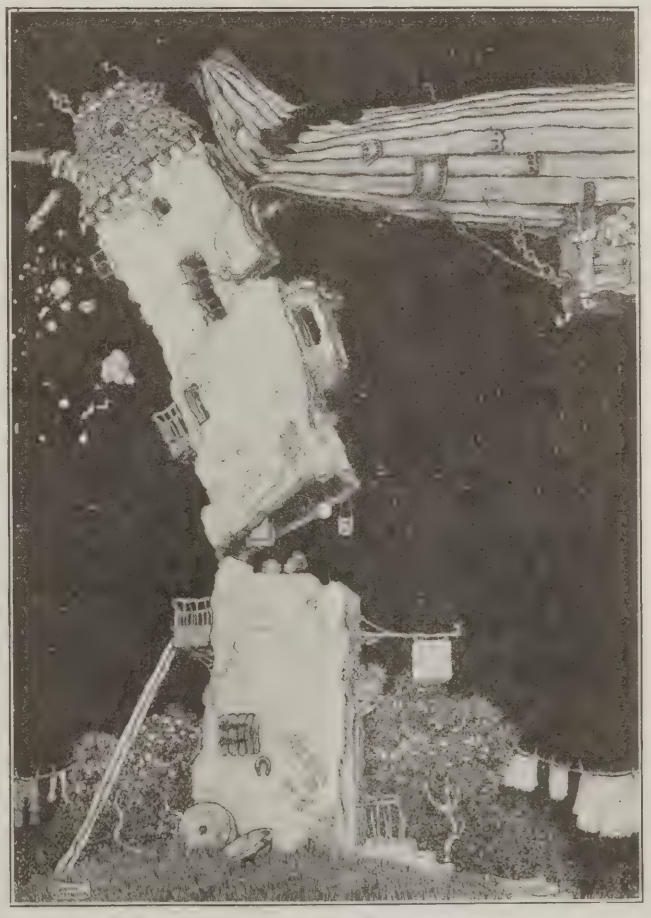
I claim him my pilot, my prince of the blue,
  I give him my heart of aye;
—But oh, he is rising, and waves me adieu,
  And whirling, he glides away.

MARGARET L. SEAMAN.

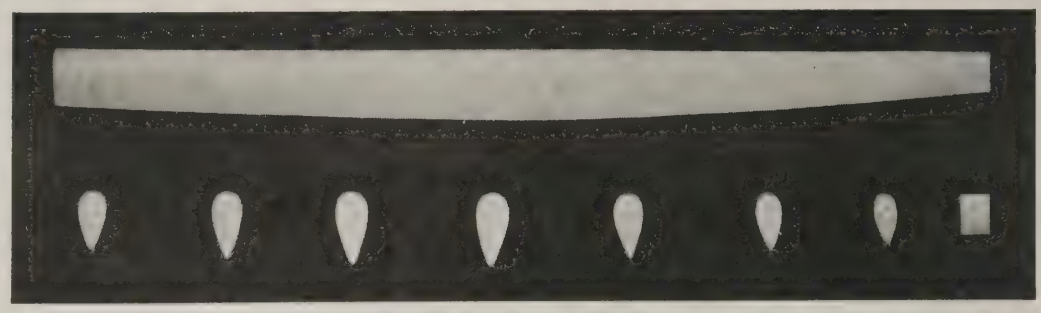
DOCTOR (*to recruit*).—Put your finger in your right ear and repeat after me what you hear me say. 36, 36, 36.
(No answer.)
49, 49, 49.
(No answer.)
Heinz' pickles.
(No answer.)
Can you hear what I am saying?
(No answer.)
DO YOU KNOW THAT JESUS WALKED ON THE WATER?
(No answer.)
DON'T YOU WANT TO JOIN THE NAVY?
(No answer.)
(In a whisper.)—Have a drink?
RECRUIT—I don't care if I do, doc.
(Accepted, 15/15.) *Our Navy.*

The recruits were not doing very well at rifle practice. "Look here," cried the instructor, "what's the matter with you fellows? There hasn't been a hit signalled for ten minutes."

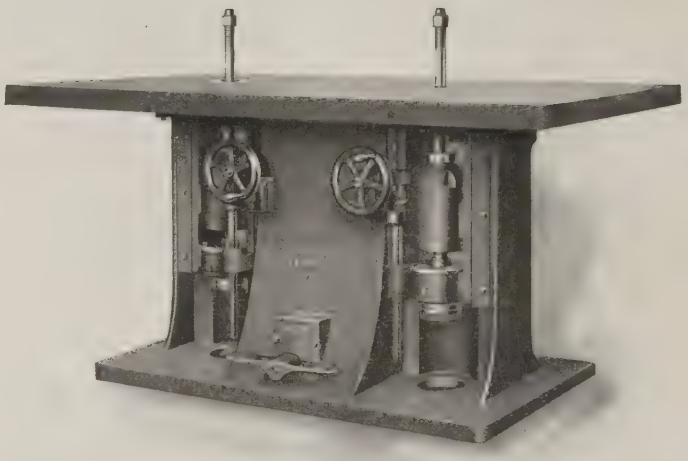
"I think we must have shot the marker, sir," replied one of the men.—*Boston Transcript.*



Striking revelations of English frivolity during a recent raid on the East Coast of England



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Promotions.

The following appointments have been made in the Officer's Reserve Corps, at the Office of the Adjutant General, January 3, 1918:

To be Captains, Aviation Section, Signal Reserve: L. J. Robinson, 4 Sherperd Ct., Detroit, Mich.; Morris C. Burnside, 112 Hendrie Ave., Detroit, Mich.; Marcus H. Rice.

To be First Lieutenants, Aviation Section, Signal Reserve: Hugh W. Rivers, 15432 Turlington Ave., Harvey, Ill.; Harry W. Jarrett, 1903 Arch Street, Philadelphia, Pa.

To be Second Lieutenants, Aviation Section, Signal Reserve: Harold Harrison Ashley, Garden City, L. I., N. Y.; James L. Grisham, Garden City, L. I., N. Y.; Harold A. Nichols, Garden City, L. I., N. Y.; John G. Bainbridge, Garden City, L. I., N. Y.; Maurice J. Reed, Garden City, L. I., N. Y.; Mortimer Mertz Lawrence, Garden City, L. I. N. Y.; Francis V. Yates, Garden City, L. I., N. Y.; Maurice R. Dood, Garden City, L. I., N. Y.; Harold A. Mayforth, Garden City, L. I., N. Y.; Luther C. Peterson, Garden City, L. I., N. Y.; Frank C. Drummond, Garden City, L. I., N. Y.; George E. Wisegarver, Garden City, L. I., N. Y.; Charles Arthur Henry, Garden City, L. I., N. Y.; Arthur T. Johnson, Garden City, L. I., N. Y.; Leverich V. V. Brooks, Garden City, L. I., N. Y.; Veech T. Baird, Garden City, L. I., N. Y.; David Ker, Garden City, L. I., N. Y.; Elbert E. Wilson, Garden City, L. I., N. Y.; Perry H. Aldrich, Garden City, L. I., N. Y.; Olaf Barco Zewadski, Garden City, L. I., N. Y.; Arthur N. Chamberlain, Garden City, L. I., N. Y.; Arthur L. Clarke, Garden City, L. I., N. Y.; George E. Lippincott, 119 D Street, N. E., Washington, D. C.; George LeRoy Hyde, Chickamauga Park, Ga.; William E. Lake, Chickamauga Park, Ga.; Hugh E. Mosher, Chickamauga Park, Ga.; William Bernhard, McCook Field, Dayton, O.; Benjamin King, Box 438, Alameda, Calif.; Elliott Southworth Church, 8 Ardmore Terrace, W. Newton, Mass.; Edward Williams, Jr.; Ft. Omaha, Neb.; Roy D. Witmer, Hotel Murphy, Richmond, Va.; Frank B. Donovan, 100 Cathedral Parkway, New York, N. Y.; Edward F. Sheehan, 13th & La. Circle, Washington, D. C.; Ralph Osgood Compton, 320 Waite Ave., Ithaca, N. Y.; William Arnold Taylor, 135 Fenimore Street, Brooklyn, N. Y.; Charles Netcher, Boston Store, Chicago, Ill.; Earle Hayden Tonkin, Chanute Field, Rantoul, Ill.; George St. Clair Dyer, Joseph E. Kirkham, Harvey L. Meyers, Reuben J. Shay, George L. Searle, Michael E. McHugh, Robert D. Connell, Elmer G. Marschuetz, Herbert N. Koons, Harold C. Fischer, Harry E. Montgomery, H. Elmer Dungan, Mark H. Redman, Clark G. Mitchell, Archer U. Rodney, Robert H. Kerr, Herbert J. Cutler.

The following appointments in Officers' Reserve Corps in Adjutant General's Office of Jan. 4, 1918, is announced:

To be Captain, Aviation Section, Signal Reserve; Oliver P. M. Goss, 4750 16th Ave., N. E., Seattle, Wash.; Henry Irving Brock, 87 Hamilton Place, New York, N. Y.; Samuel Anable, 401 Graner St., Syracuse, N. Y.; Roy S. Younglove.

To be First Lieutenants, Aviation Section, Signal Reserve: Jard K. Morse, 711 Rochambeau Apts., Washington, D. C.; Edwin Randolph Page, 1863 Kalorama Road, Washington, D. C.; Clifford Edward Dun, Malcolm A. Bateman, John O. Kirtland, Wiley R. Wright, James P. Herron.

To be Second Lieutenants, Aviation Section, Signal Reserve: Corwin Elroy Gipson, Jack Walter Schiffer, Charles W. King, Claude Archer LaBelle, John Eberle Espey, Charles Wells Jacoby, Arthur William Duckstein, Harold B. Shadle, Louis Alexander Woitishek, Frederick T. Frelinghuysen, Edwin Henry Fox, Abraham Bernard Thumel, Charles H. Schumacher, Frank Frederick Kolbe, Walter D. Binger, George E. Quisenberry, Hollace H. Jennings, Homer C. MacNeill.

Special Orders 303.

First Lieuts. Charles H. Martin and Edward M. Harding, Signal Reserve Corps, assigned to active duty at Chicago, Ill., Central Department.

First Lieut. Harrison M. Jones, Aviation Section, Signal Reserve Corps, and Second Lieut. Matthew Lahti, Aviation Section, Signal Reserve Corps, assigned to active duty reporting to Chief Signal Officer of the Army.

First Lieut. Robert M. Phinney, Signal Reserve Corps, and Second Lieut. Arthur E. Manheimer, Signal Reserve Corps, assigned to active duty reporting to Chicago, Ill., repartment signal officer for assignment.

First Lieut. Guy Z. Flanders and Second Lieut. Charles S. Pack, Signal Reserve Corps, assigned to active duty at Chicago, Ill.

Second Lieut. Francis B. Wasserboehr, Aviation Section, Signal Reserve Corps, active duty at Selfridge Field, Mount Clemens, Mich.

Major Ralph R. McCracken, Aviation Section, active duty reporting to the Chief Signal Officer for assignment.

Second Lieut. John Beveridge, Jr., Aviation Section, Signal Reserve Corps active duty at Selfridge Field, Mount Clemens, Mich

---

Capt. Thomas F. DuPuy, Aviation Section, Signal Reserve Corps, active duty at Love Field, Dallas Tex.

Capt. William Knight, Signal Reserve Corps, active duty with the 414th Telegraph Battalion, (railroad) at New York, N. Y., reporting to departmental signal officer.

To be Captains, Aviation Section, Signal Reserve: Charles Rocheid Forrest, Richard J. Gurvine, Robert Howlett, Chandler Smith.

To be First Lieutenant, Aviation Section, Signal Reserve: Edward V. Wales.

To be Second Lieutenants, Aviation Section, Signal Reserve: Alfred Charles Bame, Robert S. Olmstead, William S. Barker, Loren Donald Schiff, Owen S. Brown,, Oliver W. Shepard, Arthur I. Burgess, Lawrence K. Smith, Victor B. Caldwell, Jr., George A. Spooner, Barton M. Fitzgerald, Carl E. Sullivan, George F. Hersey, Stanley Miles Weiland, Harvey H. Holland, Frederick C. Wiggins, Walter P. McQuade.

To be First Lieutenants, Aviation Section, Signal Reserve: Robert M. Anderson, Roger Schall Kopp, George N. Belser, Harry Thomas Lyman, William V. Chapman, Harry H. Lynch, Frank Bruckner, Russell L. Maughan, John F. Buffington, James H. Maupin, Byron Merrill Burbank, Olin Woodworth Morgan, Robert M. Caldwell, Carlyle La Mar Nelson, Edward Donovan, George D. Ream, Fred Feasel, Paul F. Slocum, R. R. Fetterhoff, Harold M. Weeks, Samuel William Gray, Kenelm Winslow, Jr., William E. Grimmer, Jr., Cony U. Woodman, Emanuel Hahn, Thomas A. Wotton, Joseph F. Haskins.

AERIAL AGE
WEEKLY

Vol. 6, No. 20 JANUARY 28, 1918 10 CENTS A COPY



A French F. B. A. Flying Boat Used for U-Boat Hunting (Official Photo)

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FUEL ORDER STOPS CERTAIN INDUSTRIES FROM BURNING COAL ON DESIGNATED DAYS

NECESSARY WAR WORK NOT INCLUDED

THE United States Fuel Administration issued the following on January 16th:

The order of the United States Fuel Administrator directing the curtailment in consumption of fuel provides substantially as follows:

(1) Until further order of the United States Fuel Administrator, all persons seling fuel in whatever capacity shall give preference to orders for necessary requirements—

(a) Of railroads.

(b) Of domestic consumers, hospitals, charitable institutions, and Army and Navy cantonments.

(c) Of public utilities, telephones, and telegraph plants.

(d) Of ships and vessels for bunker purposes.

(e) Of the United States for strictly governmental purposes; not including orders from or for factories or plants working on contracts for the United States.

(f) Of municipal, county, or State governments for necessary public uses.

(g) Of manufacturers of perishable food or of food for necessary immediate consumption.

Days When Fuel May Not be Burned

The order further provides that on January 18, 19, 20, 21, and 22, 1918, no fuel shall be delivered to any person, firm, association, or corporation for any uses or requirements not included in the foregoing list until the requirements included in the list shall have been first delivered.

On January 18, 19, 20, 21, and 22, 1918, and also on each and every Monday beginning January 28, 1918, and continuing up to and including March 25, 1918, no manufacturing plant shall burn fuel or use power derived from fuel for any purpose except—

(a) Such plants as from their nature must be continuously operated seven days each week to avoid serious injury to the plant itself or its contents.

(b) Manufacturers of perishable foods.

(c) Manufacturers of food not perishable and not in immediate demand who may burn fuel to such extent as is authorized by the Fuel Administrator of the State in which such plant is located or by his representative authorized therefor upon application by the United States Food Administrator.

Newspapers and Printing Establishments

(d) Printers or publishers of daily papers may burn fuel as usual excepting on every Monday from January 21 to March 25, 1918, inclusive, on which days they may burn fuel to such extent as is necessary to issue such editions as such papers customarily issue on important national legal holidays, and where such papers do not issue any editions on a holiday they are permitted to issue one edition on the said Mondays.

(e) Printing establishments which may burn fuel on January 18, 19, 20, and 22 to such extent as is necessary to issue current numbers of magazines and other publications periodically issued.

On each Monday, beginning January 21, 1918, and continuing up to and including Monday, March 25, 1918, no fuel shall be burned (except to such extent as is essential to prevent injury to property from freezing), for the purpose of supplying heat for:

Business or Professional Offices

(a) Any busines or professional offices, except offices used by the United States, State, county, or municipal governments, transportation companies, or which are occupied by banks and trust companies or by physicians or dentists.

(b) Wholesale or retail stores, or any other stores, business houses or buildings whatever, except that for the purpose of selling food only, for which purposes stores may maintain necessary heat until 12 o'clock noon; and for the purpose of selling drugs and medical supplies only, stores may maintain necessary heat throughout the day and evening.

(c) Theaters, moving-picture houses, bowling alleys, billiard rooms, private or public dance halls, or any other place of amusement.

On the above specified Mondays, no fuel shall be burned for the purpose of heating rooms or buildings in which liquor is sold on those days.

Fuel for Street and Other Railways

No fuel shall be burned on any of the foregoing specified Mondays for the purpose of supplying power for the movement of surface, elevated, subway, or suburban cars or trains in excess of the amount used on the Sundays previous thereto.

The order provides that nothing in this order shall be held to forbid the burning of fuel to heat rooms or such portions of buildings as are used in connection with the production or distribution of fuel.

The State Fuel Administrators are authorized by the order to issue orders on special applications for relief, where necessary, to prevent injury to health or destruction of or injury to property by fire or freezing.

The order is effective in all of the territory of the United States east of the Mississippi River, including the whole of the States of Louisiana and Minnesota.

Exempts Aircraft Manufacturers

Fuel Administrator Garfield has exempted several large manufacturers of aeroplanes, motors and aeroplane accessories from the effect of his all-embracing order, including those enumerated below:

A. C. Clark Co., Chicago, Ill.
Packard Motor Co., Detroit, Mich.
Ford Motor Co., Detroit, Mich.
Lincoln Motor Co., Detroit, Mich.
Trego Motors Corporation, New Haven, Conn.

Nordyke & Marmon Co., Indianapolis, Ind.
Union Switch & Signal Co., Swissvale, Pa.
Pittsburgh Model Engine Co., Pittsburgh, Pa.
Wright Martin Aircraft Corporation, New Brunswick, N. J.
Willys Overland Co., Toledo, Ohio.
Aeronautical Engineering Corporation, Long Island City, N. Y.
General Motors Corporation, Detroit, Mich.
Curtiss Aeroplane & Motors Corporation, Buffalo, N. Y.
Thos. Morse Aircraft Corporation, Ithaca, N. Y.
Fisher Body Corporation, Detroit, Mich.
Dayton Wright Airplane Co., Dayton, Ohio.
Standard Aeroplane Corporation, Elizabeth, N. J.
Cutler Desk Co., Buffalo, N. Y.
Rubay Co., Cleveland, Ohio.
Engel Aircraft Co., Niles, Ohio.
Lewis Spring & Axle Co., Chelsea, Mich.
W. H. Mullins Co., Salem, Ohio.
National Gauge & Equipment Co., La Crosse, Wis.
U. S. Gauge Co., Sellersville, Pa.
Julius King Optical Co., 12 Maiden Lane, New York, N. Y.
Taylor Instrument Co., Rochester, N. Y.
National Cash Register Co., Dayton, Ohio.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.
American Radio & Research Corporation, 21 Park Row, New York, N. Y.
American Steel & Wire Co., Trenton, N. J.
Bausch & Lomb Optical Co., Rochester, N. Y.
Hartzell Walnut Propeller Co., Piqua, Ohio.
West Woodworking Co., Chicago, Ill.
Flottorp Mfg. Co., 4611 West Twelfth Street, Chicago, Ill.
John A. Roebling Sons Co., Trenton, N. J.
Western Electric Co., 463 West Street, New York, N. Y.
Weston Electric Instrument Co., Waverly Park, Newark, N. J.
Eastman Kodak Co., Rochester, N. Y.
Splitdorf Electric Co., 98 Warren Street, Newark, N. J.
Wyman Gordon Co., Worcester, Mass.
American Propeller Co., Baltimore, Md.
Astoria Veneer Mill & Dock Co., Long Island, N. Y.

For the manufacture of emergency Navy contracts the following firms are exempt:

Curtiss Engineering Corporation, Garden City, Long Island, N. Y.
L. W. F. Engineering Co., College Point, Long Island, N. Y.
Aeromarine Plane & Motor Co., Keyport, N. J.
The Burgess Co., Marblehead, Mass.

MAJOR SQUIER TO ASK A BILLION MORE FOR AERONAUTICS

MORE than a billion dollars, nearly twice as much as the last $640,000,000 appropriation, is to be asked from Congress by Major-Gen. George O. Squier to continue the nation's aeroplane programme. The exact figure of the estimates which Gen. Squier will submit is $1,032,294,260 for aviation, with approximately $105,000,000 extra for Signal Corps work. He will go before the House Military Affairs Committe on Monday.

It is probable the hearing will be behind closed doors, as even the general explanations made by Gen. Squier might disclose information it is desired to keep from the enemy. It is expected the committee may want to know how the huge $640,000,000 programme has progressed. Particular interest will be shown in progress already made, including number of completed machines, number of flyers trained and in training, development of the Liberty motor and outlook for quantity production of standardized parts.

The need for more funds is due primarily to the fact that Gen. Squier has turned the major part of the $640,000,000 into fighting material of some sort without permitting obstacles of any kind to block the path.

All details are barred by the censorship, says a despatch in the N. Y. *Sun*, but it may be stated the United States to-day could put more machines into aerial service than the Allies have ever used on a single day on the entire western front. On December 1 last, the Government had twenty times as many aeroplanes as on January 1, 1917, and the number since December 1 has increased at an accelerating proportion.

Even while Gen. Squier is testifying before the committee new planes, new Liberty motors, new aviators will be swelling the lists. The nation's aviation programme is to be a reality on the western front this year, and aerial fighting forces of significant proportions are in actual service now.

Credit for delivering the goods does not go to Gen. Squier exclusively, but it is shared by him with Chief Constructor Taylor of the navy and Howard E. Coffin, head of the aircraft production board. The army and navy have worked hand in glove on the programme, with the aircraft production board acting as a connecting link between the two services and rendering invaluable service, it is said, toward co-operation.

One explanation offered for results achieved in aviation is that every semblance of red tape has been eliminated and none of the incumbrances of speedy action have been permitted to choke progress. The expenditures in army aviation average $2,000,000 a day. Contractors dealing with the Government do not have to wait more than twenty-four hours for payment. Plans of prime importance are conceived, passed upon at meetings of the aircraft production board, and put into effect the same day.

That the American aeroplane squadrons will be in a position the coming year to strike effective and powerful blows at strategic German military centres and penetrate into Germany is fully realized. It is estimated the Germans have in operation on the western front, 1,000 aeroplanes on any single day. The United States Army already has appropriations for 20,000, without counting the new billion dollar appropriation, and these added to the British and French aeroplane forces indicate an overwhelming predominance over the Germans. Germany has long been building aeroplanes as fast as she could and cannot greatly increase her building capacity.

Augustus P. Gardner

By George L. Upshur

The noble Gardner is not dead,
You cannot kill a hero grand.
In everything he did and said
He showed his love for native land.
With prophet's eyes he looked so far,
With prophet's tongue he raised his voice
To rouse and save America
That she might wake and then rejoice.

America's unclosing eyes,
Grown clear and stronger day by day,
Shall see the truth writ in the skies,
That truth will ever surely say:
"Augustus Gardner, patriot true,
Who sensed our nation's peril great,
We owe a debt forever due,
A debt from citizen and state."

What happiness must it have been
Unto that brave intrepid soul,
To know that he at last had seen
Fruition of his hopes and goal.
Magnificent in death and life,
An inspiration he will be
Forever pride to man and wife
And patriotic chivalry.



The News of the Week



Major Gardner Pneumonia Victim

Major Augustus P. Gardner, former Representative from Massachusetts died at Camp Wheeler Base Hospital after a short illness of pneumonia.

Major Gardner was the first Congressman to resign in order to enlist in the Army. Major Gardner served in the Spanish-American War.

As a Congressman, Gardner was an ardent advocate of preparedness and many times pointed out the danger of our unpreparedness. Had his warnigs been heeded by the Administration, during 1914, 1915 and 1916, when he urged Congress to appropriate large sums for aviation, naval and military purposes and warned that sooner or later we would be involved in the European War, our forces would be in a position to render more effective aid to our Allies, instead of being forced to borrow supplies from them.

H. W. Blakley in Fatal Accident

Harold W. Blakley, demonstrator, and Edward J. Higgins, another employee of the L-W-F Engineering Company of College Point, dived to death at the flying field of that company near Hicksville, L. I., on January 16th, in the presence of several other flyers, L-W-F employees and some U. S. Army officials.

Blakley had just completed a series of loops with the big machine and started a spiral dive, turning it into a tail spin. None of the spectators were in any way alarmed, as Blakley had repeated the same "stunt" several times daily since the machine was first taken to the field about two weeks before. As the machine neared the ground in its dive at terrific speed the spectators saw Blakley, instead of recovering skillfully as he had done before, crash to the ground about a mile away.

Several automobiles were rushed to the scene, both men extricated from the wreck and carried at top speed to Nassau Hospital. Higgins died almost instantly and Blakley died just as the ambulance reached the hospital.

Blakley recently made a remarkable record by his flight from Rantoul, Ill., to San Antonio, Texas, in an L-W-F in 9 hours and 48 minutes. He was the first man to fly a machine equipped with a "Liberty" motor and has been known as an experienced flyer for several years. He lived at Flushing, L. I., and leaves a wife.

Higgins was an Elizabeth, N. J., man who resided at Flushing at the time of the accident. He has been connected with the L-W-F company for about a year and a half, having formerly been with the Standard Aero Corporation. His engagement to Miss M. Lalor, of Flushing, was recently announced.

The machine in which the accident occurred was a large L-W-F of new design, equipped with a "Liberty" motor, in which Blakley created an unusual record by taking it up and putting it through loops and tail spins the first time that it was off the ground.

Report on Air Propellers Issued by the National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics has just issued a pamphlet entitled: "Report No. 14—Experimental Research on Air Propellers," by Dr. W. F. Durand.

The report gives the results of tests conducted on 48 model air propellers, the shapes and dimensions of which were uniformly distributed over the range of standard practice, and the application of such results to full-size propellers through the laws of kinematic similitude. The report contains also details and descriptions of the laboratory and equipment used in the conduct of the tests.

Walton Body to Make Aeroplane Frames

The Walton Auto Body Co. has leased for five years a four-story building at Avenue D and Eleventh Street, New York City. This is being equipped with machinery for the manufacture of aeroplane frames.

Rheumatism Threatens Lufbery

In a letter to a friend in Boston, Major Raoul Lufbery, the American "ace," wrote that he does not think he will be able to keep on destroying German aircraft this winter, because he fears a return of rheumatism, to which he is subject.

Herds Sheep by Aeroplane

Stanley Smith, of Santa Monica, Cal., owner of two 90-horsepower aeroplanes, has ordered another aeroplane with which to search for lost bands of sheep in the high mountain pastures. Smith says the aeroplane method of finding lost flocks has saved him a small fortune and the lives of countless sheep. The time saved in locating them has allowed them to be rescued before the flocks starved or froze to death.

Cooper Union Starts Free Motor Engineering Course

The Cooper Union, of New York City, is adding a motor vehicle engineering course to its other night school courses, conducted by Mr. E. Favary. This course is specially designed for those who are engaged during the day in motor construction or repair, in testing departments, in drafting and designing, or in some branches of engineering, and wish to obtain a thorough knowledge of motor engineering.

The course includes classroom work, where a study of the principal parts of motor vehicles and the theory underlying their proper design and construction work will be given. The laboratory work will consist in the study of the operation of engines and the various causes affecting the indicator diagram, how to determine faulty design and construction from such diagram, etc. The testing of engine power by Prony brakes and dynamometers, the study of magnetos, efficiency of transmissions, differentials, bears and other parts of motor vehicles will also be included.

Weekly War Department Review Says Air Raids Are Crowned With Success

The weekly War Department review says that: "In spite of unfavorable atmospheric conditions French and British aviators were very busy along the whole front and brought down a number of hostile planes. Air raids into the interior of Germany were crowned with success. A French bombing squadron executed an important raid covering the industrial centers of the Baden and Alsace. Considerable military damage was done to munition works."

Aviation Section to Recruit Motor Truck Drivers

A call has been issued by the Aviation Section of the Signal Corps for 3,652 auto and gas engine men, 194 motor truck drivers, 1,360 machinists, 220 blacksmith forgers, 220 wheelwrights, 504 cabinet-makers, 460 sheet metal workers and others to a total of 7,000 for service in France behind the lines. Only men outside of the draft age are acceptable.

This regiment will have a short period of training at Fort Hancock, Ga., before going to France.

Corporal Oscar Mouvet, Foreign Legion, Wounded

Corporal Oscar Mouvet, who only recently was promoted to the rank of France's Foreign Legion because of his bravery, has been severely wounded, according to word which has been received by the New York Herald from two sources. "Jack" Casey, in Paris on permission, learned of Mouvet's wound just before he left his detachment, and a letter from the front from a companion of the corporal says he will be out of the fray for some time.

Mouvet is a brother of Maurice, the American dancer, who during the summer served in the American Ambulance in France.

Everette F. Buckley, a Kilbourne, Ill., boy in the Lafayette squadrilla, who was reported missing some time ago following a flight over the German lines, is alive and a prisoner in Germany. This news is contained in a letter just received by his family from a Swiss society which looks after the welfare of prisoners. Buckley is reported to be in good health.

Leonard Miner Reno, of Martha's Vineyard, Mass., is on the point of leaving Paris to pass a short furlough at his home. When his leave expires he will enlist in the American army. He was attached to the "Storks," Guynemer's Escadrille.

Frank W. Wells, of Los Angeles, Cal., who is flying on the Western front with a French corps, was promoted to the rank of sergeant a few days ago.

Leland Lasell Rounds, of New York, and Charles G. Grey, of Chicago, who enlisted in the Lafayette squadrilla and later were temporarily detailed to fly with a French squadron, have been notified of their transfer to the American army.

Aviation Section Asks Appropriation

The War Department's estimate for aviation amounts to $1,138,240,314. Major General Squier, Chief Signal Officer, will explain in detail the needs of the Signal Corps before the House Committee on Military Affairs, and it is expected that there will be little or no opposition to the granting of this appropriation, which exceeds the previous appropriation by a large margin.

Even this sum will probably be increased during the next few months, if our needs in aviation are to be met.

News of the Army Aviation Camps

Announcement has been made that additional buildings have been contracted for to be erected at each of the three wings of the Fort Worth flying field. Work will begin at once.

The additional buildings for Wing No. 1 will be one prophylactic office, one butcher shop, six storerooms, two barracks, two mess halls and an addition to the aero repair shop. Wings 2 and 3 will each have the same amount of new buildings, which are one prophylactic office, one butcher shop and six storerooms.

Three new Y. M. C. A. buildings will be erected at Fort Worth, one of which is under construction, and the others will be begun within a few days.



Switzerland's latest attempt at hydro-aeroplane building

News of the Aviation Camps

The Depot Brigade camp site at Camp MacArthur, Waco, Tex., which the War Department recently approved for use by the Aviation Section of the Signal Corps, with some additional land adjacent to it, can accommodate 16,000 men. Squadrons will be organized at Camp Kelly, San Antonio, Tex., and sent to Camp MacArthur to await transportation to aviation schools or overseas. The necessity for this camp was due to the large number of aviation troops at Camp Kelly and recruit depots. Camp Kelly, which was built for 15,000 troops, has been accommodating approximately 36,000 men.

American Aviator Mentioned in French Communique

J. Volney Wilson, one of five American aviators cited for daring work in a recent French communique, is a son of the Rev. G. I. Wilson, of this city, field secretary of the Presbyterian State Synod, and was himself senior student, for the ministry, at Washington and Jefferson College, when he enlisted for war service. Young Wilson, who is a corporal pilot in the escadrille for long distance bombing raids, first served as ambulance driver, then obtained a transfer. He was captain of his college track team. His brother, Gill R. Wilson, is a student in a French aviation school. Their parents have not heard from them since December 18, when Gill wrote that Volney was going on an air raid the next day.

Consulting Engineer Enlists

Mr. Samuel W. Gray, engineer with Reed & Glasser, Indianapolis, has joined the Aviation Reserve Corps as first lieutenant and has reported to Washington for service.

Army Board to Revise Rules for Physical Examinations

A board of officers to consist of Col. George E. Bushnell, U. S. Army, retired; Lieut. Col. Thomas L. Rhoads, Med. Corps; Lieut. Col. Philip W. Huntington, Med. Corps; Maj. Pierce Bailey, M. R. C.; Maj. Joseph C. Bloodgood, M. R. C.; Maj. Elliot G. Brackett, M. R. C.; Maj. William H. G. Logan, M. R. C.; Maj. Warfield T. Longcope, M. R. C.; Maj. Walter R, Parker, M R. C.; Maj. Charles W. Richardson, M. R. C.; Contract Surgeon Henry H. Morton, U. S. Army; (alternate, Contract Surg. William A. Pusey, U. S. A.) has been appointed to meet at Washington, D. C., at the call of the senior member for the purpose of revising the regulations for the physical examination of applicants for enlistment in the Army and for registrants under the selective-service regulations.



© Committee on Public Information

Building the frame-work for aeroplane wings. The utmost precision is required in this work

NAVAL and MILITARY AERONAUTICS

Notes of Our Aviators in France

According to the European edition of the New York Herald, Hobey Baker, the former Princeton football and hockey star, brought down his first German aeroplane.

Searg. Geo. Houdek of the Thirteenth Aerial Squadron and Lieut. Williams S. Ely was killed in an aeroplane accident while training in France.

A United Press correspondent with "The American Army in France" reports that no serious casualties have occurred for six weeks at one of the biggest American flying schools in France, excepting two slight injuries reported in landing accidents. A dozen machines have been wrecked, each being the result of misjudgment in landings.

American aviators conducted an air raid over the German battle lines as a reprisal for the killing of two wood choppers by a German bombing expedition the previous week.

Through the courtesy of French and British officers, American flying students have taken part in observation and photographic work on French and British aeroplanes.

Aviators of the Lafayette Escadrille attacked two German photographic aeroplanes at an altitude of 28,000 feet, according to a New York World dispatch. Three engagements resulted successfully for the aviators of the Escadrille, in each case the enemy being driven off from over the Allied lines.

The details of transfer of members of the Layfette Escadrille into the American army now being gone through and they will soon be officially with the American air forces. Army officers state that they have no official permission to wear the decorations awarded to the flyers by the French Government, but if one of the several bills now pending in Congress is approved, the necessary permission will be granted.

Lufbury has been offered the command of an American training school in France. In a letter to his father, published in the daily press, he writes that he prefers active service on the front to teaching behind the lines. The Germans have set a price on Lufbury's head, but his aggressive methods of attack will win him many laurels if he holds to his resolution of refusing the offer which will take him away from actual fighting.

The members of a recently graduated flying class are now on the front going through the last stage of training over the German lines in their own machines, accompanied by experienced French and British aviators.

Dummy Aeroplanes Serve French As Targets

Dummy aeroplanes, suspended from a cross bar secured to the trunk of tall trees are being used by French airmen as practice targets. The wind blowing the tiny planes gives them the necessary motion, and the small size of the targets makes hits quite difficult to obtain.

An effort is being made to acquire fields of from 20 to 50 acres for landing purposes between the aviation fields at Millington and Memphis, Tenn.

San Antonio's new aviation field will be known as Brooks field, in honor of the late Sidney J. Brooks, who met death at Kelly Field on November 13th, when making his final flight for commission in the Aviation Section.

Montgomery's aviation field will be known as Taylor Field. A large number of buildings are in the course of construction.

Two new buildings have ben added to the U. S. Military Aeronautics at the University of California, Berkeley, Cal. A big frane barrack has just been completed and a headquarters has been established in an adjoining residence. The mess hall in the new building is already in use, and the capacity of the school will be materially increased because of the recent additions.

New barracks have been completed at the U. S. School of Military Aeronautics at Ohio State University. The new barracks, besides



Guglielmo Marconi, inventor of wireless telegraphy, heading Italian mission to the U. S.

sleeping quarters, contain baths, free barber shop and waiting rooms. The gynasium used by the aviators is now open to university students. A landscape artist has been employed by the Government to beautify the surroundings of the barracks.

Special Orders 4-5-6

Capts. Alford Guy and Arcemus Carter, Aviation Section, Signal Corps, recently appointed from first lieutenants, Infantry, will proceed to Camp Hancock, Augusta, Ga., and report in person to Col. C. G. Hall, Signal Corps, for assignment to duty.

The following-named officers of the Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, Garden City, Long Island, N. Y., for assignment to duty: First Lieut. Richard B. Berry, First Lieut. James H. S. Olds, First Lieut. Horace N. Heisen, First Lieut. Linus J. Murphy, First Lieut. Stephen A. Ross, First Lieut. Harvey F. Houck, First Lieut. Miner C. Markham.

First Lieut. George John Kinberg, Aviation Section, Signal Reserve Corps, is assigned to active service and will report to the commanding officer, aviation depot, Garden City, Long Island, N. Y., for duty.

First Lieut. Louis M. Krewet, Aviation Section, Signal Reserve Corps, is assigned to active service, will proceed to Washington, D. C., and report to the Chief Signal Officer for duty.

First Lieut. Augustus J. P. Gallagher, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commandofficer, Hazelhurst Field, Mineola, Long Island, N. Y., for duty.

The termination on December 15, 1917, by direction of the President, of the appointment of Temporary Lieut. Col. George M. Bomford, Signal Corps, as temporary lieutenant colonel, Signal Corps, only, is announced.

The appointment of Harlie Hartley Hicks as captain in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty and will report in person to the Chief Signal Officer, Washington, D. C., for duty.

The appointment of James William Flanagan as second lieutenant in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty and will report in person to the Chief Signal Officer, Washington, D. C., for duty.

The following-named officers are designated as members of the board of directors, National Rifle Association of America, as representatives of the War Department: Lieut. Col. Morton C. Mumma, General Staff, Lieut. Col. George T. Bowman, General Staff, Maj. Edgar Z. Steever, 3rd, Aviation Section, Signal Corps.

By direction of the President, Capt. Eley P. Denson, 38th Infantry, is detailed for service and fill a vacancy in the Signal Corps.

First Lieut. George W. Clayton, 17th Infantry, will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for assignment to duty.

Second Lieuts. George H. Huppert and Clyde F. Wright, Signal Reserve Corps, are assigned to active duty and will proceed to Little Silver, N. J., and report to the commanding officer, Camp Alfred Vail, for duty.

Second Lieut. Stuart F. Kosters, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Garden City, Long Island, N. Y., and report in person to the commanding officer, aviation concentration camp, for duty.

The resignation of First Lieut. William G. Shull, Signal Reserve Corps, of his commission as an officer in that corps is accepted by the President, to take effect this date.

First Lieut. Paul S. Williams, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer. Chanute Field, Rantoul, Ill., for assignment to duty.

First Lieut. Harry W. Thompson, Aviation Section, Signal Reserve Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from November 17, 1917.

First Lieut. Norman W. Potter, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Fort Sill, Okla., and report to the commanding officer, Post Field, for duty.

The honorable discharge, by direction of the President of First Lieut. James S. Griffith, Signal Corps, National Guard of the United States (Texas), under the provisions of section 9 of the act of Congress approved May 18, 1917, as of date of January 4, 1918, is announced.

First Lieut. Harry W. Jarrett, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Earl E. Neubig, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to comanding officer, Garden City, Long Island, N. Y., for duty.

First Lieut. John M. Baker, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Garden City, Long Island, N. Y., for duty.

Second Lieut. Charles H. La France, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Edward J. Burnett, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will proceed to Waco, Tex., and report in person to the commanding officer, aviation mobilization camp, Camp MacArthur, that place, for duty and by letter to the Chief Signal Officer, United States Army, this city.

Capt. Thomas L. Long, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will proceed to Waco, Tex., and report in person to the commanding officer, aviation mobilization camp, Camp MacArthur, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.

First Lieut. James J. H. Baxter, Aviation Section, Signal Reserve Corps, is assigned to active service and will report to the commanding officer, Love Field, Dallas, Tex., for duty.



A British fighting hydroaeroplane (British official photo)

Second Lieut. Frederick R. Lexow, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Mount Clemens, Mich., and report to the commanding officer, Selfridge Field, for duty.

Second Lieut. Joseph Bernard, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Morrison, Va., and report in person to the commanding officer, aviation concentration camp, for duty.

First Lieut. Thomas E. Graves, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Rockwell Field, San Diego, Cal., for duty.

A board of officers, to consist of Capt. James B. Tailer, Aviation Section, Signal Reserve Corps, and First Lieut. Charles E. Connor, Medical Reserve Corps, is hereby appointed, to meet at Minneapolis, Minn., for the purpose of examining applicants for commission in the Aviation Section, Signal Reserve Corps.

The appointment of Master Signal Electrician Charles M. Schumacher, 138th Aero Squad, as second lieutenant in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty. He will report to the commanding officer, Love Field, Dallas, Tex., for duty.

The appointment of Private First Class Malcolm A. Bateman, Signal Enlisted Reserve Corps, as first lieutenant, Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty and will report to the commanding officer, Chanute Field, Rantoul, Ill., for duty.

The appointment of Private First Class Claude Archer La Belle, Signal Enlisted Reserve Corps, as second lieutenant in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty. He will report in person to the Chief Signal Officer, Washington, D. C., for duty.

The appointment of Privates First Class Arthur William Duckstein, and Louis Alexander Woitishek, Signal Enlisted Reserve Corps, as second lieutenants, Aviation Section, Signal Officers' Reserve Corps, is announced. They are placed on active duty and will report to the commanding officer, aeronautical concentration camp, Garden City, Long Island, N. Y., for duty.

Second Lieut. Herbert L. Boehm, Aviation Section, Signal Reserve Corps, is assigned to active duty, and will report in person to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Ten Broeck Howard, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to this city and report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Robert C. Harrington, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Lake Charles, La., and report in person to the commanding officer, Gerstner Field, for duty.

Second Lieut. Leavitt J. Buckley, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for assignment to duty.



Cabane and upper right aileron of the British Handley-Page biplane (British official photo)

First Lieuts. William J. Creighton and John McCullough Johnson, Aviation Section, Signal Reserve Corps, are assigned to active service and will report to the commanding officer, Gerstner Field, Lake Charles, La., for duty.

Second Lieut. Frank B. Donovan, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

Capt. Morris Claibourne Burnside, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Love Field, Dallas, Tex., for duty.

First Lieut. Robert E. Lee, Aviation Section, Signal Reserve Corps, is assigned to active service and will report to the commanding officer McCook Field, Dayton, Ohio, for duty.

The following-named officers, Aviation Section, Signal Reserve Corps, are assigned to active service and will report in person to the commanding officer, Wilbur Wright Field, Fairfield, Ohio, for assignment to duty: First Lieut. Arthur F. Seaver, First Lieut. John E. Davidson, First Lieut. Frank W. Tilman, First Lieut. William H. Bretting, First Lieut. Herman V. Boley, First Lieut. Walter C. Davis, First Lieut. Howard C. Binley.

Second Lieut. Arthur V. Moninger, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Carlstrom Field, Arcadia, Fla., for assignment to duty.

Second Lieut. Robert Mackenzie Wellwood, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Taylor Field, Montgomery, Ala., for duty.

First Lieut. Wilbur F. Wright, Aviation Section, Signal Reserve Corps, is assigned to active service and will report to the commanding officer, Kelly Field, South San Antonio, Tex., for duty.

Second Lieut. Samuel F. Meece, Signal Reserve Corps, is assigned to active duty, effective January 2, 1918. He will proceed to Little Silver, N. J., and report to the commanding officer, Camp Alfred Vail, for duty.

First Lieut. Hugh Ward Rivers, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army, Washington, D. C., for duty.

The appointment of Jared K. Morse as first lieutenant in the Aviation Section, Signal Reserve Corps, is announced. He is placed on active duty. He will report in person to the commanding officer, aviation concentration camp, Morrison, Va., for duty.

The appointment of Corwin Elroy Gipson as second lieutenant in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty. He will report to Col. Brice P. Disque, Yeon Building, Portland, Oreg., for duty.

The appointment of Oliver P. M. Goss as captain in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty. He will report in person to Col. Brice D. Disque, Yeon Building, Portland, Oreg., for duty.

First Lieut. Charles C. Cook, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Langley Field, Hampton, Va., for assignment to duty.

Capt. James B. Taylor, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Washington, D. C., for temporary station with Washington Aviation Examining Board, and upon completion of which he will proceed to Minneapolis, Minn., and take station with the aviation examining board in that city.

Second Lieut. Christopher C. O'Leary, Signal Reserve Corps, is assigned to active duty and will report in person to the department signal officer, Central Department, Chicago, Ill., for duty.

Second Lieut. Edward Frances Sheehan, Aviation Section Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer, Washington, D. C., for duty.

Second Lieut. Roy D. Witmer, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer, Washington, D. C. for duty.

Temporary First Lieut. Albert E. Holleman, Signal Corps, will proceed to Portland, Oreg., and report in person to Col. B. P. Disque, Signal Corps, Yeon Building, for duty.

Capt. Frank Ondriek, Signal Corps, will proceed to Camp Hancock, Augusta, Ga., and report in person to the commanding officer for assignment to duty.

Maj. Marion O. French, Aviation Section, Signal Corps, will proceed without delay to Camp Hancock, Augusta, Ga., and report in person to the commanding officer, signal troops, at that camp for duty.

First Lieut. Francis A. Connolly, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report to the commanding officer, Scott Field, Belleville, Ill., for duty.

First Lieut. James R. Ashley, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the commanding officer, Kelly Field, South San Antonio, Tex., for assignment to duty.

First Lieuts. Eno Campbell and Vincent J. Meloy, Aviation Section, Signal Reserve Corps, are assigned to active service and will report to the commanding officer, aviation general supply depot, Garden City, N. Y., for duty.

First Lieut. Frank N. Coraner, Aviation Section, Signal Reserve Corps, is relieved from duty as a member of the board of officers appointed in paragraph 94, Special Orders, No. 263, War Department, November 10, 1917, and will proceed via Washington, D. C., to Portland, Oreg., and take station as a member of the board of officers created in letter orders of the Adjutant General dated January 3, 1918, for the purpose of examining applicants for commission in the Aviation Section, Signal Reserve Corps.

First Lieuts. T. T. Bryan and W. Jeffe, Signal Corps, will proceed to Portland, Oreg., and report to Col. B. P. Disque, Signal Corps, Yeon Building, for assignment to duty.

First Lieuts. James W. Francis, George H. Gwinn, Joseph B. Irwin, and Alfred A. Camerer, Aviation Section, Signal Reserve Corps, are assigned to active duty and will report to the commanding officer, Chanute Field, Rantoul, Ill., for duty.

First Lieut. Louis S. Connelly, Aviation Section, Signal Reserve Corps, is assigned to active duty and will proceed to Dayton, Ohio, and report in person to the chief signal officer, McCook Field, for assignment to duty.

The appointment of Private First Class Harley Franklin Brown as second lieutenant in the Aviation Section, Signal Officers' Reserve Corps, is announced. He is placed on active duty and will report in person to the commaning officer, Army Balloon School, Fort Omaha, Nebr., for duty.

PROTECTING THE EYES OF AIR AVIATORS

WITH tens of thousands of the finest specimens of America's young manhood becoming interested in the air service, any discussion which broadens the knowledge of the problems which have to be overcome is of inestimabe value. The subject of proper protection of their eyes is one of the most important, and the following extracts from an article by the well-known optical expert, L. C. Martin, B. Sc., which appeared originally in *Nature*, are of interest and value.

Efficient protection of the eyes from glare is a subject of considerable importance at the present time, but unfortunately a great deal of misconception has arisen in regard to it. Most glare protectors are designed for conditions of unusually strong illumination; generally speaking, for daylight. Many industrial operations also demand the use of light filters. We will deal first with the problem of protection in sunlight.

A great deal of experimental work has been done recently on the physiological effects of ultra-violet radiation in the eye, a quartz-mercury lamp being used as a source, which is especially rich in its omission of the shorter wave-lengths. The results, unquestionable and undoubted, are that with long-continued exposure serious harm may result from the absorption of these shorter waves by the refracting media of the eye, but with low intensities of radiation regular exposures produce no permanent effect. Turning now to the effects of daylight on the eyes, we recognize that few cases occur in which the symptoms point directly to the influence of ultra-violet light as distinct from the effects of ordinary strong illumination; but the problem of nerve strain arising from glare is ever present.

Low Intensities and Glare.

Quite low intensities of light will produce glare when the eye is unadapted. The light from a gas lamp, blinding to an eye accustomed to darkness, appears feeble when viewed in full sunlight; yet its intensity of ultra-violet radiation is unchanged. Snow blindness may be caused on dull days, presumably owing to the inability of the upper part of the retina to adapt itself to the unaccustomed light from the ground. Dr. E. K. Martin could detect no absorption by the reflecting media of the eye in the visible spectrum, but he found that in the ultra-violet absorption begins at about .38u, and becomes complete for .35u and shorter wave-lengths. As the solar spectrum stops short at .29u (owing to the absorption of the atmosphere), we see that there is a short region from .35u to .29u, which may be absorbed and produce some physiological action. Therefore, in cases where considerable sunlight or skylight must enter the eye, it is a good precaution to use a filter which will stop these ultra-violet rays, and at the same time it must be remembered that the main symptoms known as glare are not due to ultra-violet light at all, but simply to an illumination too intense for an unadapted retina.

To the normal eye the maximum luminosity in the solar spectrum lies in the region near the yellow. A great many filters now being supplied for anti-glare purposes are of a yellowish color. They transmit eighty per cent or so of the red, yellow and green, and absorb the violet and ultra-violet fairly completely. It would seem at first sight as if such filters were very desirable to eliminate possibly harmful rays, and to reduce slightly the brightness of transmitted light. On using the screen, however, the apparent brightness of most objects seem to be increased and glare is as evident as before. The phenomenon of adaptation is not yet fully understood, but we may refer in this connection to the work of Broca and Sulzer, who found in measuring the growth of visual sensation with time, and using various colors, that in every case there is an overshooting of sensation beyond its final value. With blue light the maximum sensation is at least five times, and with white light twice, the final value. If, then, the removal of the shorter wave-lengths interferes with adaptation, the apparent increase of brightness when using a yellow filter is explained. Obviously, as an anti-glare glass, the screen is worse than useless. This does not apply to the greenish glasses which actually reduce the apparent luminosity. In passing it may be noted that a colored filter of this nature is often useful for increasing contrast, eliminating blue light from haze, and increasing visual acuity. "Amber" and "red" filters are sometimes used. These generally

(*Continued on page* 891)

The appointment of Fred J. Miller as major in the Ordnance Reserve Corps is announced. He is placed on active duty and assigned to station in New York, N. Y. He will report by letter to the Chief of Ordnance, Washington, D. C., for duty.

First Lieut. Richard Wrenshall, Ordance Reserve Corps, is assigned to active duty and will take station at Washington, D. C., and report in person to the Chief of Ordnance for assignment to duty.

The following captains, Aviation Section, Signal Corps, recently appointed from first lieutenants, Infantry, will proceed to Camp Hancock, Augusta, Ga., and report to Col. C. G. Hall, Signal Corps, for duty: Michael Burke, Arthur Harris.

Cap. Edward H. Oakley, Aviation Section, Signal Reserve Corps, will proceed to Atlanta, Ga., and report to the commanding officer, School of Military Aeronautics, for duty.

Capt. Everett E. Simmons, signal Corps, will proceed to Augusta, Ga., and report in person to the commanding officer, Signal Corps Detachment, Camp Hancock, for duty.

Second Lieut. Victor Frank Camp, Aviation Section, Signal Reserve Corps, active duty, reporting to the Chief Signal Officer.



The latest type of Nieuport biplane now being used by the French Air Service (French official photo)

THE 230 H. P. BENZ AERO ENGINE

THE following detailed description of the 230 h.p. Benz engines is based on information courteously placed at our disposal by officials of the British Air Board. Being of a far more detailed nature than any particulars that have hitherto been published relating to German aero engines, this description will be read with interest by all concerned in aero engine design and construction.

Leading Features of the Engine

Following the usual German aero engine practice, the 230 h.p. Benz is of the six-cylinder vertical water-cooled type. Each separate cylinder is bolted to the crankcase by long bolts and studs, which pass through the crank chamber top half and secure the crankshaft bearings between the top and bottom halves of the crank chamber.

Two inlet and two exhaust valves are fitted in the head of each cylinder. The valves are operated by overhead valve rockers working on ball-bearings and by push rods on either side of the cylinders. The two camshafts, which run on plain bearings, are nearly arranged inside the top half of the crankcase, and the floating exhaust camshaft is provided with half-compression cams.

The pistons are of cast iron, fitted with three exceptionally wide rings, and the piston heads, following usual Benz practice, are supported by conical steel forgings riveted and welded to the piston crown, which bear on the centre portion of the gudgeon pins, through slots cut in the connecting-rod small ends.

As in the 160 h.p. Benz engines, two separate two-jet caburettors are fitted, each having their air in-take passages through the top half of the crankcase casting. Each carburettor supplies three cylinders through an independent branched induction pipe, built up of light aluminum tube.

The lubrication of the crankshaft and connecting-rod bearings is effected by a very neatly designed gear pump working in an auxiliary oil reservoir formed in the bottom of the air-cooled base chamber.

An oil-sealed petrol pump of interesting design supplies petrol to the carburettors in conjunction with a supplementary pressure reservoir enclosed in the main petrol tank. The petrol pump is driven off the rear end of the inlet camshaft. The same driving spindle also operates the machine-gun interrupter gear and the tachometer drive.

Constructional Details

Cylinders—Except for the steel water jackets, the cylinders are made entirely of cast iron. The water-jacketed heads, including the twin inlet and exhaust valve passages, are cast integral with the cylinder castings.

The bore of the cylinders is 145 mm. and the thickness of the cylinder walls tapers from 5.5 mm. at the base flanges to 6.5 mm. at the top of the cylinder barrels. The water jackets are of die-pressed sheet steel, built up from half sections and welded both at the vertical joints and at the bottom of the water jackets to flanges machined on the outside of the cylinder barrels. The water jackets are exceptionally long, extending to within 45 mm. of the cylinder base flanges. Seven annular corrugations are formed in the water jackets to allow for expansion, and three transversely in the sheet steel crown of the water jackets.

The water spaces formed in the cylinder-heads and the cooling of the valve pockets is well carried out. Dished plates are welded in position in the water space above the crown of each cylinder to deflect the flow of water on to the exhaust valve pockets. The diameter of the cylinder-head water connections is 60 mm.

The cylinder registers extend to 10 mm. below the base flanges into the crank chamber, and are held down by four 12 mm. studs, and also by dogs at four points. The dogs are secured by long studs which pass through the top half of the crank chamber and are screwed into the bottom halves of the main bearing housings, which are cast integral with the bottom half of the base chamber. The parts of the holding-down studs which screw into the aluminum are of larger diameter and of coarser pitch. The nuts which secure the cylinder holding-down clamps are of interesting design, being of circular cupped formation and drilled radially with four

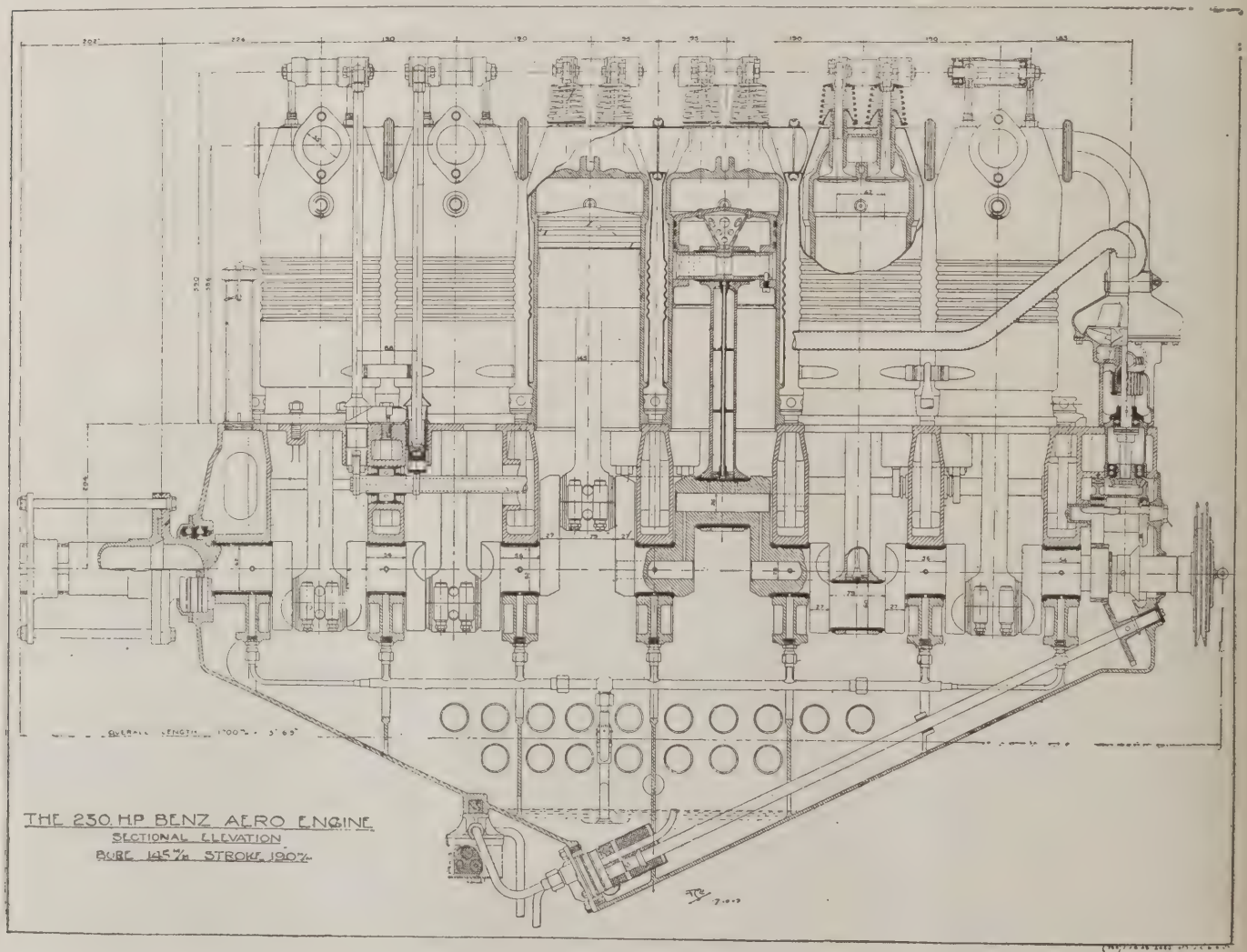


Fig. 4.—Sectional general arrangement

12 mm. holes for screwing up with a "Tommy Bar."

The total weight of each cylinder complete with valves, valve springs and valve rocker-supports equals 44.25 lbs.

Pistons.—The pistons, with the exception of the small conical pillars, are made entirely of cast iron, and weigh 7.62 lbs. each, complete with rings and gudgeon pin.

Three rings are provided above the gudgeon pin, the lower one being a scraper ring. The width of each ring is 8 mm., and the width of gap in cylinder equals 0.45 mm. The space between the two top rings is 4.25 mm., whilst the scraper ring is 10 mm. below the middle ring; 4-mm. pegs are provided to locate the radial position of each ring, and six 2-mm. holes are drilled in the piston below the scraper ring.

The slightly doned head of each piston is supported by a hollow conical pillar, which is machined from a steel forging and is riveted on to the underside of the piston, as shown in the sectional drawing of the piston (Fig. 5). The lower end of the conical pillar, which is machined at the same time as the holes in the gudgeon pin bosses are bored, bears on the centre part of the gudgeon pin, and to allow for this the centre portion of the top of the connecting-rod small end and gudgeon pin bush is cut away. By this construction the greater part of the force of the explosion is transmitted from the head of the piston directly to the connecting-rod.

The gudgeon pins are 38 mm. diameter, and are bored 30 mm. inside diameter. The centre portion of the gudgeon pin is 25 mm. bore for a depth of 20 mm., where the conical piston head support bears on the centre of the gudgeon pin. The piston ring side clearance equals 0.004 in. The diameter at the top of the piston equals 144.15 mm. The diameter at the bottom of the piston equals 144.67 mm.

Connecting-rods.—The very clean design of the tubular connecting-rods is apparent in the photographic views, and the details of their construction are clearly shown in the sectional drawing (Fig. 6).

The whole of the connecting-rod, including the lugs for the four bolts securing the halves of the big end, is machined all over from a steel forging. The outside diameter of the tubular rod is 36 mm. and the inside is bored with a 30-mm. hole from the crankpin end to within 6 mm. of the gudgeon pin bush—the bottom end of the bore being fitted with a screwed plug.

A 6-mm. steel pipe, for lubricating the gudgeon pin, is fixed inside the centre of the connecting rod, and the pipe is supported in the centre by two flanged discs, as shown in the drawing. The weight of the big end is lightened by four 12-mm. holes and one 30-mm. hole drilled radially through the big end. Two semi-circular oil grooves are machined in the white metal of the big end bearing caps, and one lateral groove is cut in the top portion of the big end bearing. The total weight of the complete connecting-rod is 7 lbs. 1 oz.; the big end weighing 4 lbs. 12 ozs. and the small end 2 lbs. 5 ozs.

Total big end side clearance equals 0.15 mm., and the float of the small end bush between the gudgeon pin bosses equals 14 mm.

Crankshaft.—The six-throw crankshaft runs on seven plain bearings, and weighs 109.25 lbs., including the propeller boss.

The cranks are, of course, set at 120°, and the diameter of all the journals is 62 mm., whilst that of the crankpins is 60 mm. The length of the front journal bearing (propeller end) equals 79 mm., and the length of the other journal bearings equals 54 mm., with the exception of the rear end bearing, which is 55 mm.

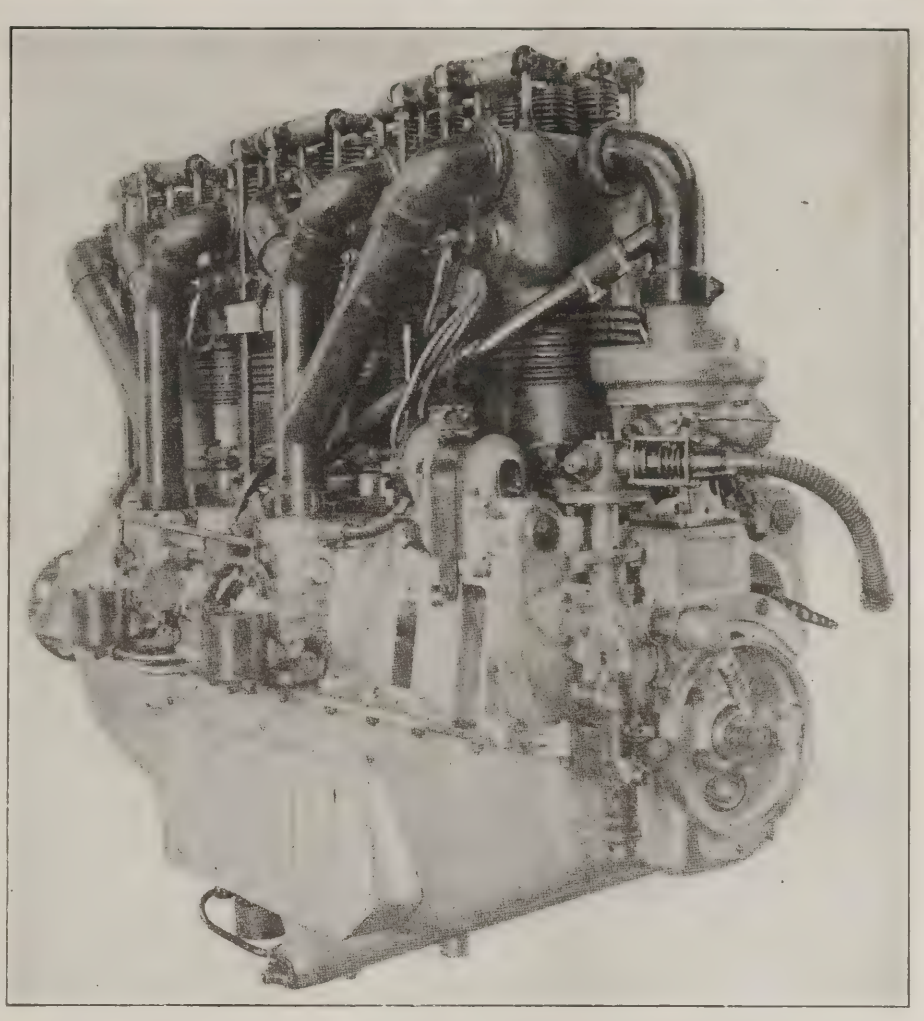


Fig. 1.—Part end view of the 230 H. P. Benz engine showing gasoline and water pump

The crankshaft journals and crankpins are bored for lubrication, the webs being drilled with communicating holes in the usual manner. The internal diameter of the holes bored in both the crankpins and journals is 27 mm. The ends of the holes are plugged with sheet steel discs sweated into the recessed ends of holes, and all the discs which plug the rear ends of the holes in both the crankpins and journals are drilled with a central 5-mm. hole, presumably with the idea of lubricating the camshafts with the oil thrown out by the cranks.

A double-thrust ball race, 120 mm. diameter, is fitted at the front end of the crankshaft behind the front flange, to which the propeller hub is bolted. The thrust races are large enough to be assembled over the cranks, and are secured in position by a split collar which is screwed on to the crankshaft. The halves of the split collar are held together on the screw thread on the shaft by a recess cut in the split collar. This recess holds a corresponding flange turned on the crankshaft. Details of this construction are shown in the sketch in Fig. 7.

Fitted to the rear end of the crankshaft is a friction clutch for operating the wireless drive, which is designed so that the driving brake-shoes of the clutch can be thrown in or out of engagement with the driving pulley from the pilot's seat, through the action of two wedges, which operate the friction shoes through ball-ended levers.

The propeller boss is attached to the crankshaft by a flange which is bolted to a corresponding flange on the end of the crankshaft by eight 14-mm. bolts. Full details of the propeller boss are given in the sectional drawing (Fig. 21).

Valves and valve gear.—The twin inlet and exhaust valves work vertically in the cylinder heads, and are operated as previously mentioned by rockers mounted on ball-bearings, carried by supports screwed into the cylinder head. The general design of the valves and valve springs is shown in Figs. 8 and 9.

The rocker levers operate the valve stems through hardened steel rollers which are mounted on eccentric bolts. These, in conjunction with adjustable spherical joints screwed into the top ends of the vertical push rods on each side of the cylinders, give a fine adjustment for the tappet clearances. The spherical joints on the valve rockers are evidently provided to simplify the alignment of the valve rocker supports which are screwed into the cylinder heads.

Semi-spherical joints are also provided at the bottom ends of the push rods, which work in steel cups inside the hollow tappets, and it should be noted that the hardened steel rollers of the tappets are slightly off-set from the camshaft centres, and each pair of tappet guides is held in position by a steel bridge clamp.

The dimensions of both the inlet and exhaust valves are the same, each valve weighing 1.25 lbs. The lift of the inlet valves equals 0.465 in., and lift of the exhaust valve equals 0.443 in. Clearance of inlet tappet equals 0.009 in., exhaust 0.015 in.

(To be concluded)

STABILITY IN GENERAL*

By HARLAN D. FOWLER, Aeronautical Engineer

(Continued from page 705)

PART III.

Lateral Stability as Applied to Aeroplanes and Seaplanes in General

IN this class of stability there are four center of applications of forces. These are (1) the total weight (*W*) of the machine acting downward through the *C. G.;* (2) the lift (*L*) created by the wings and some parts of the aeroplane, acts upward through the *C.P.;* (3) the side pressure (*P*) acting through the *C.A.;* (4) the centrifugal force (*F*) acting outward through the *C.G.* of the machine.

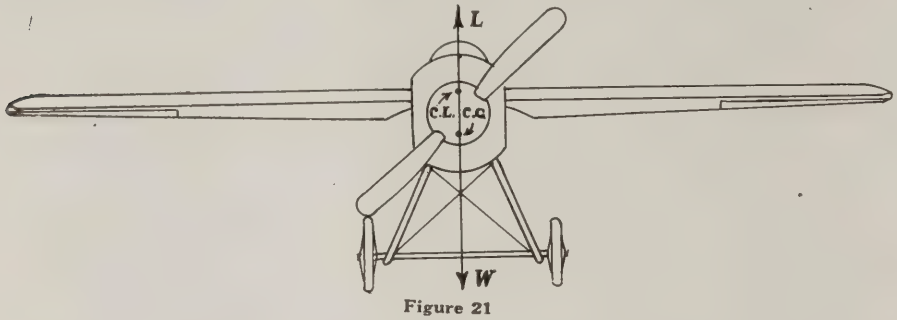


Figure 21

When in full flight lateral stability is had when the *C.L.* is at the center of the span of the aeroplane and directly in the vertical line of action of the weight through the *C.G.* (Fig. 21). The two causes whereby the above ideal condition of lateral stability is disturbed are (1) when a gust of wind strikes a portion of the wings, and (2) when attempting a turn.

Unless properly designed for, a gust of wind may easily turn the entire aeroplane wing tip over wing tip. To counteract whatever disturbances may be caused by wind gusts, wing warping, or ailerons are employed. The ailerons method of controls are in general use at the present time, principally because of the simplicity in construction and the satisfactory promptness of their answer to the pilot's movements.

When an unevenly distribution of gusty wind acts upon the wings, one side is immediately caused to rise and the other side to lower. The result is that the *C.L.* is shifted along the transverse axis to a point determined by the intensity of the gust and the tendency of the wing to respond to the force of the gust. If the gust is very strong and the area of the wings large the *C.L.* may be caused to move to a point well out on the wing which is raised, because this wing has an excess lift. Whether the gust is vertical, horizontal or diagonal to the flight path the same principles holds, *i. e.,* that due to the increase of speed of the air on the aeroplane wings, higher pressure is created, and that point or part which receives this increase in pressure is bound to respond to it by rising, Fig. 22.

The movement of the *C.L.* is the corresponding point through which *L* acts vertically upward. This vertical line intersects a central plane about which the aeroplane is symmetrical and in which the *C.G.* must line-up with—at some point above *C.G.* as *M*. As long as *M* is above *C.G.* the machine is stable laterally and *M* is the equivalent to the "metacenter" of a ship, the vertical distance between *M* and *C.G.* being the equivalent of the "metacentric height." A relatively low *C.G.* is therefore necessary to the maintenance of inherent lateral stability.

While the metacentric principle is practical when certain conditions are understood, it is not at the present time possible to determine closely just what this righting effect might be. However, at small angles of roll up to about 10°, there will be some corrective couple due to this cause, provided the *C.G.* is sufficiently low. Until a better understanding of the wind forces which act upon the wing surfaces, and the corresponding disturbances—pressure, angles of yaw, etc.—are known, the ailerons will be made to keep the aeroplane in lateral equilibrium. For example, assume a gust struck a wing at a resultant point of 10 feet from the *C.G.*, with a force of 100 lbs. the side pressure (*P*) is therefore $-P = 100$ lbs., and the distance $p = 10$ feet, $-P.p = -1000$ ft. lbs. With two ailerons whose center is 15 feet from the *C.G.* of the machine, the necessary corrective force which they must exert on the air is $\frac{1000}{15 \times 2} = 33$ lbs. The aileron on the high side of the wing is raised, and the aileron on the lower wing is lowered. See dotted lines in Fig. 22. The minus sign is ignored in this case because of the employment of two ailerons.

Owing to the tendency of designer to completely cover-in everything in the body so as to cut down the resistance as much as possible, and also to provide comfort to whoever may be carried from the wind, the side area presented to the wind is greater than formerly. The position of the *C.A.* relative to the *C.G.* has grown in importance to such an extent that in turning an oversight on this particular point may result in a serious spiral not to be very easily gotten out of.

To secure that no turning tendency shall be produced it is necessary that the line of action of the total resultant side pressure shall act through the *C.G.* of the machine. Then the only effect on the machine will be bodily motion sideways without any turning effect. Unfortunately, the center of side pressure varies in position with changes in the direction and the strength of the gust or wind; so complete balance under all conditions is impossible, unless the rudder is employed.

When an aeroplane is turning there will be a probability of it being subjected to a side wind pressure. With the *C.A.* forward of the *C.G.* the nose will tend to move in the direction of the wind, and to counteract this the force on the rudder must be brought into action as indicated in Fig. 23.

If the *C.A.* is back of the *C.G.* (Fig. 24), the nose will tend to move in the direction from which the wind comes, and rudder will have to be reversed.

If a wind comes from the inside of the turning circle along which the aeroplane is turning, and the *C.A.* is forward of the *C.G.* the machine will try to turn out of its circular path. If the *C.A.* is back of the *C.G.* the machine will turn towards the center of the circle with the result that the continual side pressure will finally cause the aeroplane to turn around much too rapidly and to terminate into a spiral nose dive. However, if the wind blows from outside of the turning circle the *C.A.* back of the *C.G.* would be the most favorable.

Fins above and below the *C.G.* have similar affect on the aeroplane when turning. The careful designing and proper placing of them relative to the *C. G.* is to be studiously looked into. A dihedral has the effect of fins, the projected area due to the rise of the wings having this property.

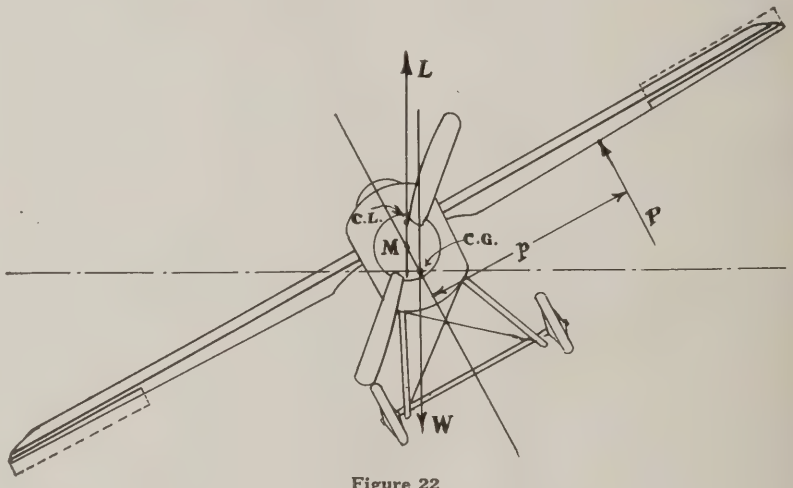


Figure 22

When a mass travels on a circular path, centrifugal force tends to make it move off at tangent. Its circular path is maintained only so long as there is a centripetal force to oppose the centrifugal force; and this centripetal force is provided in an aeroplane by banking the machine at the turn so as to tilt the wing pressure towards the center of the turning circle.

When thus tilted, the wind pressure on the wings provides a centripetal force acting towards the center of the turning circle as well as a vertical force supporting the machine in flight. But, if the total pressure on the wings is no greater than it was when the machine was flying on a straight level path, the vertical lifting force when the machine is banked will be entirely inadequate to prevent the gradual descent of the aeroplane. In short, it will no longer be equal to the weight of the machine.

It is fundamental, therefore, that either the aeroplane must descend while turning, or else be in a position to increase the power output from its engine, so as to fly faster or at a coarser angle, in order to augment its wing pressure sufficiently to maintain the complete support of the aeroplane as well as the centripetal force required for turning.

If the aeroplane is banked to 45°, and has sufficient reserve power to keep on the same level while turning, then there is a centripetal force equal to the weight of the machine. For this case we can find the radius of the turning

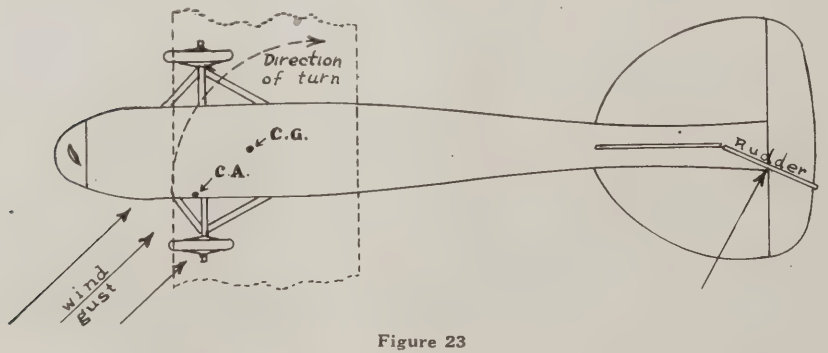


Figure 23

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circle by writing

$$F = \frac{W \cdot v^2}{g \cdot r} = W \quad (7);$$

as at a bank of 45° $F = W$ then formula (7) becomes

$$r = \frac{v^2}{g}. \qquad (8)$$

Of a series of aeroplanes all banked to the same amount, the slowest machine will thus turn in the shortest radius. In the above example, if the machine is flying at 100 miles per hour, or 146.7 ft. per sec., the radius for a 45° bank is about 670 feet.

Fig. 25 shows the wing pressure required for various excessive banks that are required to maintain a machine on a constant level while turning. It will be observed that the radius of the turning circle is only dependent on the wing loading in so far as that function is expressed in the flight speed.

Inasmuch as the centripetal force for any banked turn executed without increase of wing pressure, and therefore on a descending spiral, may be written $F = W \sin \theta$, where θ is the angle of bank from the vertical and W is the weight in flight, the radius for any such turn becomes

$$r = \frac{v^2}{g \sin \theta}. \qquad (9)$$

By calculating the radius of the turning circle of an aeroplane the force on an aileron may be found.

Assume that the aeroplane must make a 45° bank and that $W = 2500$ lbs., $v = 65$ m.p.h., or 95.3 ft. per second, and $g = 32.16$. Substituting in formula 2 we have $r = \frac{95.3^2}{32.16} = 284$ feet.

The lift of an aileron is in the direct ratio of the lift of an aeroplane, and inverse to the distance of the center of the aileron from the *C.G.* of the machine. Suppose this distance is 16 feet and let x represent the lift of the ailerons, therefore 16 : 294 :: x : 2500

Or $x = \frac{2500 \times 16}{284} = 141$ lbs. for two ailerons, one on each end of the wing, or 70½ lbs. for one aileron.

It is to be pointed out here, that there is another important factor to be considered and that is the moment of inertia of the aeroplane. A machine which carries its load and structural parts closely concentrated will be able to turn much quicker than an aeroplane which is considerably "spread out." But as the moment of inertia requires considerable calculation to determine its value, it should not enter into the preliminary design.

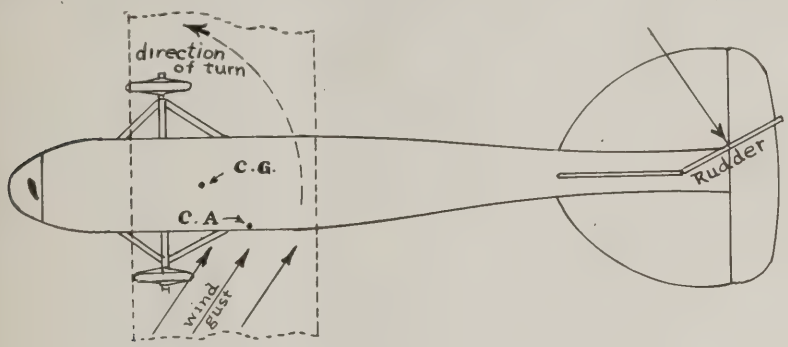


Figure 24

Lateral Stability as Applied to Kite Balloons and Dirigibles

Lateral angular disturbances of the kite balloon and airship depend upon whatever controlling planes are attached to the side of the body, their area, and distance from the longitudinal axis. In practice, the rolling moment is counterbalanced to a large extent by the powerful righting couple due to the weight of the car and balloon structure acting through the *C.G.*

In Fig. 26 a roll of θ degrees is represented, d is the distance between the metacentric M and the center of gravity, W is the weight of the dirigible less the weight of the contained gas, acting through the *C.G.*, and $V(\rho - \sigma)$ (10) is the buoyancy, where V is the enclosed volume of the envelope, and ρ and σ are the densities of the air and gas respectively, in lbs. per cubic foot.

When the dirigible inclines the position of the *C.B.* changes to $C.B._1$ and the vertical line through $C.B._1$ intersects the line *C.G.*-*C.B.* at the point M, which for small inclinations of roll is the metacenter. $C.B.$-M is designated the metacentric height of the body, and is such that M is the limiting position to which the *C.G.* may rise without the body becoming unstable. The righting couple, therefore, is

$$V(\rho - \sigma)\, d \sin \theta, \quad (11).$$

Assume that the capacity of the gas bag is 77,000 cu. ft. For hydrogen, the buoyancy is $V(\rho - \sigma) = 77{,}000\ (.08 - .0055) = 5{,}736$ lbs., and $W = V(\rho - \sigma) - V \cdot \sigma = 5{,}736 - (77{,}000 \times .0055) = 5{,}736 - 426 = 5{,}310$ lbs. The angle of roll will be taken as 5° and d is 20 ft. Therefore, the righting couple to be expected from this source is $5{,}736 \times (20 \times .0872) = 10{,}016$ ft.-lbs. This would be able to take care of a side pressure on the dirigible of about 5,000 lbs. acting at a point of 20 ft. above the *C.G.*

When a rudder is put over, the air pressure upon it at once causes or tends to cause the vessel to pursue a curvilinear path; this pressure may be resolved into : — (*a*) A component in the fore and aft direction, tending to retard the progress of the vessel; (*b*) A component, Q, acting laterally or perpendicular to the longitudinal plane through the *C.P.* of the rudder. In addition to Q we have the air resistance, R, due to centrifugal action, and the centrifugal force $\frac{W \cdot v^2}{g \cdot r}$. These forces are shown acting upon the dirigible when turning in Fig. 27.

Upon the disposition of these forces will depend the angle to which the vessel will incline. The inclination will be governed by the relative values of the acting forces and their absolute directions; it will vary according to the position of the *C.G.*, say, relative to the keel.

Generally the vessel will incline inwards or outwards, according to whether the *C.G.* occupies a low or high position in the vessel, while for some intermediate position of the *C.G.* the vessel will remain upright—dependent upon the value of v.

(*To be concluded*)

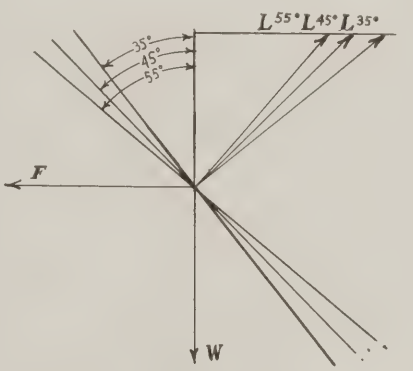


Figure 25

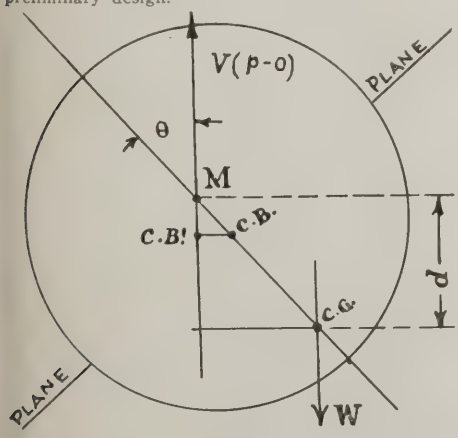


Figure 26

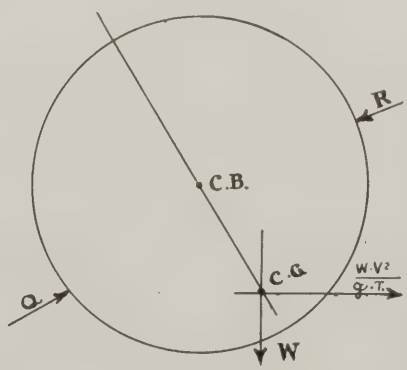


Figure 27

Protecting the Eyes of Air Aviators

(*Continued from page* 887)

absorb the green and blue parts of the spectrum, transmission again beginning in the violet. If fairly deep in color they effectually stop glare, and may be exceedingly useful for special contrast work.

Neutral Tints

Neutral-tinted glasses have a comparatively uniform transmission over the whole spectrum. The use of such filters in practice immediately reduces any glare, and a proper balance of adaptation is established. It is curious to note in this connection that many of these neutral-tinted glasses, when about 1 mm. thick, transmit the ultra-violet from .39u to .32u almost as well as ordinary glass. They have often a slight increase of transmission in the green, and in the extreme red and infra-red they again show little absorption beyond that expected from glass of equivalent thickness. Light transmitted by a bundle of such glasses is found to consist of the extreme red, a little green and the extreme violet; the sky, viewed through the bundle, appears of a deep purple color.

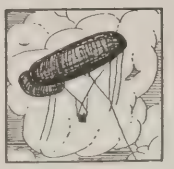
Intense infra-red radiation also seems to produce well-marked effects on the eyes when exposure is regular and long continued, but here again the amount ordinarily received by an eye exposed to daylight appears to be incapable of causing harm. It is uncertain how much, if any, of the discomfort of glare from the ground experienced in bright sunshine is due to the action of these rays. A correspondent of Sir W. Crookes describes the effect produced by the spectacles of a glass containing ferrous iron, and absorbing the infra-red, as producing a marked cooling effect on the vision. This sensation may, of course, be merely the result of the relief from glare which the blue-green tint of the glass would secure. Manifestly, however, in circumstances where it may be necessary to look directly at or near the sun, an efficient filter is desirable to reduce intensity in all parts of the spectrum.

Some glasses show marked absorption in the infra-red in the neighborhood of 1u notably those containing ferrous iron, cupric oxid, or ferric iron and cobalt together; these are blue to blue-green in color. Interesting substitutes are metallic films on glass, suitably protected, which, for the most trying conditions, should make ideal glare glasses. As most of the radiation would be reflected, glasses would tend to keep cool.

The problems arising in industrial work are relatively simple. For dealing with arc lamps, and sources extremely rich in ultra-violet light, dark green or brown-green glasses will be most suitable. For welding operations efficient protection from ultra-violet, visible light, and infra-red is important, and in this case it is necessary to watch the source of light intently. It is important also to select a filter which will not greatly distort the color of the emitted light, as temperatures are judged in this way. A fairly dark neutral glass of good thickness will generally answer all practical purposes, but a highly efficient protector could be made by depositing a silver film of suitable thickness, on a plate of heavy lead glass. This would be, as previously suggested, very effective in reflecting the heat rays, but the film would have to be protected.

A gold film can be made to transmit green light while reflecting almost all other radiations. Spectacles of this nature could be used with great advantage if it were necessary to work close to molten metal, or in many other circumstances.

It is hoped that this short summary of the subject may be of use to those dealing with problems in this connection. An extended series of tests on certain filters has been made by the present writer, and the results are in course of publication in the Proceedings of the Optical Society. Filters for various purposes can thus be chosen, but their most important test will be their efficiency in actual use.



MILITARY AEROSTATICS



A Zeppelin Surprise

By Jhadoo Jahaz

MANY interesting points arise out of the raid of October 19th and subsequent events, not the least of which is the extraordinary height to which the airships attained. The writer has been endeavoring to arrive at some figures of lift and weights which would enable the airships to land more or less in equilibrium, after reaching 20,000 feet, and the results of those calculations are given here in the hope that they may prove of interest. It must be remembered, however, that it has been largely working in the dark and the figures are not put forward as in any way to be relied upon, but they may at any rate give some idea of the magnitude of the achievement and of the enormous strides in airship design which have been made during the war.

Following the ordinary formula, which is only an approximation, that an airship loses one-third of its lift for every 1,000 feet risen, at a height of 20,000 feet two-thirds of the gross lift will have been lost through the expansion of the gas. In an airship of 2,000,000 cubic feet, having a gross lift of sixty tons, this amounts to forty tons, which means that the fixed weights must be no more than twenty tons. The next step in the calculation, then, is to draw up a table of weights in the endeavor to keep them within the limit of twenty tons.

Mr. Warner Allen, who has produced the only approximately accurate description of the airships, states that the weight of the "structure" is ten to twelve tons. Using this as a basis and acting on the assumption that by "structure" he refers to the hull framework—when the figure appears reasonable—we arrive at the following estimated table of weights:

	Tons
Hull framework	12
Outer cover, gas bags, etc.	5
Planes	1
Framework of cars	1½
Power plant (five engines, gearing, propellers, etc.)	2½
Fuel tanks	1
Armament, wireless, etc.	½
Miscellaneous weights	1
Total	24½

If these weights are correct—and it is difficult to see how they could be reduced, as they err rather on the side of lightness—judging by the rough approximation given above, an airship of this type cannot rise to 20,000 feet, even when unloaded, or, to be more precise, it cannot rise *statically* to that height, though it could probably be forced up by means of the elevators, but on coming down again it would be too heavy to allow of a safe landing being made. As the information of the height reached is so very definite and given on such reliable authority, it is desirable to check the result by adopting more precise methods of calculation. The variable factors which affect the lift, and therefore the performance, of an airship of given volume and weight are:

(1) The purity of the hydrogen with which it is filled.

(2) The atmospheric pressure, shown in inches on the barometer.

(3) The temperature.

The theoretical lift of pure hydrogen is 71.55 pounds per 1,000 feet, at normal temperature and pressure (N. T. P.), but it is usual to calculate on the basis of the hydrogen containing 5 per cent of air or other impurities—*i.e.*, being 95 per cent pure. This represents a lift of 68 pounds per 1,000 cubic feet. Normal barometric pressure is usually taken as being 30 inches on the ground, it being subject to a fall of approximately 1 inch per 1,000 feet of ascent. On the night of October 19th the barometer on the ground was almost the standard, so that we can assume that the pressure at 20,000 feet would be $30 - 20 = 10$ inches.

With any gas a change in the temperature is accompanied by a regular corresponding variation in the volume of the gas. At a temperature of 460° Fahr. the limit is reached below which no further contraction can take place, and this point is known as *absolute zero*.

To find the corresponding Absolute temperature for any temperature on the Fahrenheit scale, all that is necessary, then, is to add or subtract 460° to the Fahrenheit temperature, according to whether the temperature is above or below zero (Fahrenheit). The "Normal" temperature is 60° Fahr. or 520° Absolute. According to the extracts published from the log-book of L.49, the lowest temperature recorded—which would be presumably at the maximum height reached—was −30° Fahr. or 430° Absolute.

The two last variables depend upon the law—familiar to chemists—known as Boyle's Law which states that the volume of any gas varies directly with the pressure to which it is subjected—or, in other words, a *fall* in temperature and a *rise* in pressure reduce the volume of gas, and *vice versa*.

We have now arrived at a decision as to the conditions prevailing at the time of the raid regarding each of the three variables, and will therefore formulate our equation on the assumption of a hydrogen purity of 95 per cent, barometric pressure of 10 inches, and absolute temperature of 430°. The lift of an airship per 1,000 cubic feet of its volume in any given condition will be: Theoretical lift of pure Hydrogen (71.55) × Actual purity of Hydrogen per cent × Actual bar. pressure × Normal Absolute Temperature.

$$\frac{(520)}{\text{Normal bar. pressure (30)} \times \text{Actual Abs. Temp.}}$$

Substituting we get:

$$71.55 \times \frac{95}{100} \times \frac{10}{30} \times \frac{520}{430} = 27.4 \text{ lbs.}$$

Under the conditions prevailing, then, the lift of the airship per 1,000 cubic feet would be only 27.4 lbs., and the gross lift would have fallen (the volume being 2,000,000 cubic feet) from 60 tons on the ground to 24.5 tons. This figure, it will be seen, exactly coincides with our estimated total of the weight of the airship itself without any crew, fuel, or bombs. The bombs would have been dropped before the airship reached its maximum height, but at least half the petrol would remain unexpended, and, of course, the weight of the crew would remain in the cars.

For a journey of this nature the crew would probably number 20—aggregating 3,200 pounds—and fuel for 20 hours at least would be carried. Five 240 horse-power Maybach engines would consume (at 0.5 pounds per horse-power per hour) about 600 pounds of petrol per hour. The airship would carry then about 12,000 pounds of petrol, of which some 4,200 pounds would have been consumed during the eight hours' flight to London. We are, therefore, forced to the conclusion that the airship would be too heavy by some 11,000 pounds (the weight of the crew plus the unexpended petrol) to rise statically to 20,000 feet when over London. On the rough basis that 1.30 of the lift is lost for each 1,000 feet risen, this 11,000 pounds represents a height of:

$$\frac{11{,}000}{134{,}400 \text{ (60 tons)}} \times 30 = 2{,}500 \text{ ft.}$$

This distance the airship could easily cover by "planing" up under the influence of the elevaotrs. She would, of course, still be 11,000 pounds heavy on coming down again, but on landing the captain would drop any petrol remaining and land "heavy" by the precise amount of the weight of the crew. As this is only about 1½ tons, the operation should not be difficult with a good pilot, particularly if he were landing into the hands of a trained landing party.

It would appear from the foregoing that the latest type of Zeppelin is designed to be able to attain a height of 17,000 to 18,000 feet when over its objective, and after dropping its bombs, but is capable of going even higher under stress of circumstances and at the risk of suffering some slight damage on returning to its base. These conclusions accord well with Mr. Warner Allen's statements that these airships "are built with a view to flying at between 16,000 and 18,000 feet." Of course, on a short flight they could go higher in view of the reduced quantity of petrol to be carried.

One statement from the above-named source requires some explanation. It will be seen that if the total of fixed weights given earlier in this article be deducted from the gross lift of 60 tons, 35½ tons are available for "disposable weights," such as crew, fuel, bombs, and water ballast. Of this 1½ tons are taken up by the crew and 5½ tons by fuel. Mr. Allen states that the maximum of bombs that can be carried is 2½ tons. If this be so, the Zeppelin must carry in the neighborhood of 26 tons of water ballast, which seems excessive in view of the fact that a considerable portion of this weight, at any rate, might be allotted to bombs, which may be looked upon as ballast, as they can be dropped at any moment required when over the sea or hostile territory.—*Aeronautics.*



Latest type of French observation blimp (French official photo)

Soldiers Lumbering in Northwest

In order to alleviate the shortage of spruce and to bring up its production to the 15,000,000 board feet required monthly to supply the extra needs for aircraft construction, ten thousand soldiers have been sent into the woods of the Northwest as the Spruce Production Division of the Signal Corps.

These men are volunteering from Western National Army Camps and from civil life and from other services to counteract the trouble caused by I. W. W. agitation in the Western lumber camps. Practically all the students of the State College of Forestry have enlisted in these logging squadrons and have left Syracuse for Vancouver barracks.

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications in addition to those printed in our issue of January 7th:

Specifications for Half-Hard Carbon Steel Bars and Billets

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The I. A. S. B. standard steel No. 1045 shall be used; its composition is as follows:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1045	0.40–0.50	0.50–0.80	0.450	0.050

When electric or crucible furnace steel is specified in the order, the maximum allowable percentages of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

MANUFACTURE.—3. (*a*) The steel shall be manufactured, or at least finished by the open-hearth, electric furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) The billets from which the bars are made are to be rough turned or chipped to remove all surface defects which might produce seams in the finished bar or forging. No undercutting in chipping will be allowed.

Heat Treatment.—(*d*) The manufacturer shall state the heat treatment recommended to give physical properties specified.

(*e*) If the bars are delivered in the heat-treated condition, and the physical tests show that the heat treatment has not been correct, the bars may be retreated at the option of the purchaser.

WORKMANSHIP AND FINISH.—4. (*a*) The bars are to be sound, commercially straight, free from pipes, laps, cracks, twists, seams, voids, and damaged ends, and are to have a workmanlike finish. They are to be uniform in quality, within the stipulated margins of manufacture, capable of being turned and threaded readily and of taking a good finish.

(*b*) Any bar may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The bars shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	95,000	65.8
Minimum yield point	70,000	49.2
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) In all cases in which impact testing machines of the pendulum type are available, tests may be carried out to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

SELECTION OF TEST SPECIMENS.—6. Three bars of each size rolled from a heat shall be taken and test pieces prepared in accordance with the I. A. S. B. standards. Each test piece and the bar from which it is cut shall be stamped with an identifying number. Should any of the test pieces, after being heat treated in the manner recommended by the steel manufacturer, fail to show the prescribed physical properties, new test pieces similarly identified shall be made from the same three bars. At the option of the purchaser the steel manufacturer may prescribe a different heat treatment for the second set of test specimens, and to that end he may make such tests as he desires from the remainder of the three bars taken for the tests. Should any of the three specimens taken for the final tests fail to show the required physical properties, the bars of that heat of the size represented by the specimens shall be rejected. Where bars are purchased in the heat-treated condition, test specimens shall be cut from the heat-treated bar.

DIMENSIONS AND TOLERANCES.—7. The dimensions and tolerances shall be those given in the specification 3S11.

DELIVERY, PACKING, AND SHIPPING.—8. (*a*) The bars may be delivered in the annealed or in the heat-treated condition.

(*b*) The bars shall, in general, be grouped in bundles weighing not more than 220 pounds (100 kg.), unless otherwise agreed between manufacturer and purchaser. The heat and the I. A. S. B. steel serial numbers shall be plainly marked on a metal tag attached to each bundle. If bars are not so grouped and bundled, each bar shall be plainly marked with the heat number and the I. A. S. B. steel serial number.

Specifications for Heat-Treated Alloy Steel Forgings and Stampings

(130,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S5.

MANUFACTURE.—3. *Heat treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	130,000	91.5
Minimum yield point	115,000	80.9
Minimum elongation in 2 inches or proportional gauge length	17 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) This test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 k. g.) or over.*—(*a*) If desired each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 k.g.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Half-Hard Carbon Steel Bars and Billets

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The I. A. S. B. standard steel No. 1045 shall be used; its composition is as follows:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1045	0.40–0.50	0.50–0.80	0.450	0.050

When electric or crucible furnace steel is specified in the order, the maximum allowable percentages of phosphorus and sulphur may, at the option of the purchaser, be limited to 0.03 per cent.

MANUFACTURE.—3. (*a*) The steel shall be manufactured, or at least finished by the open-hearth, electric furnace, or crucible process.

(*b*) A sufficient discard shall be made from each ingot to secure freedom from piping and undue segregation.

(*c*) The billets from which the bars are made are to be rough turned or chipped to remove all surface defects which might produce seams in the finished bar or forging. No undercutting in chipping will be allowed.

Heat Treatment.—(*d*) The manufacturer shall state the heat treatment recommended to give physical properties specified.

(*e*) If the bars are delivered in the heat-treated condition, and the physical tests show that the heat treatment has not been correct, the bars may be retreated at the option of the purchaser.

Workmanship and Finish.—4. (*a*) The bars are to be sound, commercially straight, free from pipes, laps, cracks, twists, seams, voids, and damaged ends and are to have a workmanlike finish. They are to be uniform in quality, within the stipulated margins of manufacture, capable of being turned and threaded readily and of taking a good finish.

(*b*) Any bar may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

Physical Properties and Tests.—5. (*a*) The bars shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	95,000	65.8
Minimum yield point	70,000	49.2
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) In all cases in which impact testing machines of the pendulum type are available, tests may be carried out to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Selection of Test Specimens.—6. Three bars of each size rolled from a heat shall be taken and test pieces prepared in accordance with the I. A. S. B. standards. Each test piece and the bar from which it is cut shall be stamped with an identifying number. Should any of the test pieces, after being heat treated in the manner recommended by the steel manufacturer, fail to show the prescribed physical properties, new test pieces similarly identified shall be made from the same three bars. At the option of the purchaser the steel manufacturer may prescribe a different heat treatment for the second set of test specimens, and to that end he may make such tests as he desires from the remainder of the three bars taken for the tests. Should any of the three specimens taken for the final tests fail to show the required physical properties, the bars of that heat of the size represented by the specimens shall be rejected. Where bars are purchased in the heat-treated condition, test specimens shall be cut from the heat-treated bar.

Dimensions and Tolerances.—7. The dimensions and tolerances shall be those given in the specification 3S11.

Delivery, Packing, and Shipping.—8. (*a*) The bars may be delivered in the annealed or in the heat-treated condition.

(*b*) The bars shall, in general, be grouped in bundles weighing not more than 220 pounds (100 kg.), unless otherwise agreed between manufacturer and purchaser. The heat and the I. A. S. B. steel serial numbers shall be plainly marked on a metal tag attached to each bundle. If bars are not so grouped and bundled, each bar shall be plainly marked with the heat number and the I. A. S. B. steel serial number.

Specifications for Seamless Copper Tubes

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. (*a*) The copper used shall be lake or electrolytic, conforming to the I. A. S. B. specification 2N2.

(*b*) Samples for analysis may consist of turnings taken from the end of the tube or of drillings. The points from which drillings are taken must be distributed around the surface of the tube so as to yield a representative sample of the tube wall.

Manufacture.—3. The tubes shall be made from a crucible cast ingot by hot piercing and rolling and shall be finished by cold drawing in such a manner as to give the physical properties specified.

Workmanship and Finish.—4. (*a*) The tubes shall be clean, smooth, and free from all injurious defects, both inside and outside.

(*b*) Any tube may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

Physical Properties and Tests.—5. The tubes shall be subjected to the physical tests in the state in which they are furnished, unless otherwise noted.

Flattening Test.—(*a*) A piece of tube two diameters in length shall be flattened with a hammer until it passes freely through a micrometer caliper set at three times the thickness of the tube wall. The tube must withstand this test without showing cracks or other defects.

Crushing Test.—(*b*) A sample of the tube one and one-half diameters in length must withstand crushing endwise to half of its original length without splitting or cracking.

Bend Test.—(*c*) Strips cut both longitudinally and transversely from the tube shall be subjected to a bend test; they must withstand being bent cold through an angle of 180° around a diameter equal to the thickness of the strip without cracking. When the tubes are furnished annealed, strips cut therefrom must withstand being bent flat until the sides meet and being hammered to a fine edge without cracking.

Hydrostatic Pressure Test.—(*d*) Each tube shall be subjected to a hydrostatic pressure which will develop a tensile stress of 7,000 pounds per square in (4.92 kg./sq. mm.) in the tube, but in no case will a test pressure of more than 1,000 pounds per square inch (0.703 kg./sq. mm.) be required.[1] Each tube must withstand this test without cracking, bulging, or giving indication of flaws, leaks, cracks, or other defects.

[1] The pressure to be applied shall be calculated from the formula

$$P=\frac{7{,}000T}{R}$$

Where P=the hydrostatic pressure in pounds per square inch.
T = the thickness of the tube wall in inches.
R=the internal radius of the tube

Selection of Test Specimens.—6. (*a*) Each tube shall be subjected to the hydrostatic test; one tube from each lot of 100 or less shall be subected to the flattening, bending, and crushing tests.

(*b*) If any tube fails to pass the flattening, bending, or crushing test, two more tubes representing the same lot shall be subjected to all of these tests. If either of these tubes fail in any of the tests, the lot which they represent shall be rejected.

(*c*) Any tube failing to pass the hydrostatic test shall be rejected.

Dimensions and Tolerances.—8. (*a*) The following tolerances will be allowed on wall thickness and outside diameter:

Tolerance for outside diameter and wall thickness.

Outside diameter.	Tolerances on outside diameter.	Wall thickness.	Wall-thickness tolerances.
Inches.	*Inch.*	*Inch.*	*Inch.*
0–0.50	±0.002	0–0.0156	±0.001
0.51– .75	± 00.25	0.0157– .0312	± .002
0.76–1.00	± .003	.0313– .0625	± .003
1.01–1.25	± .0035	.0626– .1250	± .005
1.26–1.50	± .004	.1251– .2500	± .008
1.51–1.75	± .0045	.2501– .3125	± .0125
1.76–2.00	± .005	.3126– .3750	± .015
2.01	±(.25%)		
Millimeters.	*Millimeter.*	*Millimeters.*	*Millimeter.*
0–12.70	±0.05	0–0.39	±0.03
12.71–19.05	± .06	0.391– .79	± .05
19.06–25.40	± .08	0.791–1.59	± .08
25.41–31.80	± .09	1.591–3.17	± .13
31.81–38.10	± .10	3.171–6.35	± .20
38.11–44.45	± .11	6.351–7.94	± .32
44.46–50.80	± .13	7.941–9.53	± .38
50.81	±(.25%)		

Length.—(*b*) When no length is specified, tubes may be shipped in stock lengths of 10 feet (3.04 m.) to 14 feet (4.27 m.). When ordered in definite lengths, no length shall be less than that specified.

Specifications for Aluminum Alloy Sheet

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The aluminum alloy of these sheets shall be made rfom standard No. 1 aluminum conforming to I. A. S. B. specification 2N1. The specific gravity of the aluminum alloy shall not be greater than 2.85.

Manufacture.—3. No scrap shall be used other than that produced in the manufacturer's own plants and which is of the same composition as the material specified.

Workmanship and Finish.—4. (*a*) All sheets shall be sound, flat, free from buckles, seams, discoloration, or other surface defects.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

Physical Properties and Tests.—5. The sheets may be specified in either of two tempers as desired. Specimens cut in any direction from the sheets must have the following physical properties:

Tensile Test.—(*a*)

	Temper 1.		Temper 2.	
	Pounds per square inch.	Kilograms per square millimeter.	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	55,000	38.6	50,000	35.1
Minimum yield point	25,000	17.5	25,000	17.5
Minimum elongation in 2 inches	15 per cent.		20 per cent.	

Bena Test.—(*b*) Strips cut from sheets of either temper shall withstand being bent cold through an angle of 180° around a diameter equal to four times the thickness of the sheet.

Selection of Test Specimens.—6. Test specimens shall be cut from a sheet selected from each 500 pounds or individual lot submitted of less than 500 pounds.

Dimensions and Tolerances.—7. The tolerances upon sheets shall be those given in the table below:

Brown & Sharpe gauge.	Thickness.	Tolerance.	Thickness.	Tolerance.
	Inch.	*Inch.*	*Millimeters.*	*Millimeter.*
10–17	0.1019–0.0453	±0.003	2.588–1.151	0.076
18–26	.0403– .0159	± .002	1.024– .404	.051

Delivery, Shipping, and Packing.—8. The sheets shall be delivered in boxes of gross weight not greater than 220 pounds (100 kg.).

Specifications for Aluminum Alloy Sheet

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The aluminum alloy of these sheets shall be made from standard No. 1 aluminum conforming to I. A. S. B. specification 2N1. The specific gravity of the aluminum alloy shall not be greater than 2.85.

Manufacture.—3. No scrap shall be used other than that produced in the manufacturer's own plants and which is of the same composition as the material specified.

Workmanship and Finish.—4. (*a*) All sheets shall be sound, flat, free from buckles, seams, discoloration, or other surface defects.

(*b*) Any sheet may be rejected because of injurious defects or faults in manufacture at any time, notwithstanding that it has previously passed inspection; it shall be returned to the manufacturer at

the latter's expense. This clause shall not be taken to apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. The sheets may be specified in either of two tempers as desired. Specimens cut in any direction from the sheets must have the following physical properties:

Tensile Test.—(*a*)

	Temper 1.		Temper 2.	
	Pounds per square inch.	Kilograms per square millimeter.	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	55,000	38.6	50,000	35.1
Minimum yield point	25,000	17.5	25,000	17.5
Minimum elongation in 2 inches	15 per cent.		20 per cent.	

Bent Test.—(*b*) Strips cut from sheets of either temper shall withstand being bent cold through an angle of 180° around a diameter equal to four times the thickness of the sheet.

SELECTION OF TEST SPECIMENS.—6. Test specimens shall be cut from a sheet selected from each 500 pounds or individual lot submitted of less than 500 pounds.

DIMENSIONS AND TOLERANCES.—7. The tolerances upon sheets shall be those given in the table below:

Brown & Sharpe gauge.	Thickness.	Tolerance.	Thickness.	Tolerance.
	Inch.	*Inch.*	*Millimeters.*	*Millimeter.*
10–17	0.1019–0.0453	±0.003	2.588–1.151	0.076
18–26	.0403–.0159	± .002	1.024–.404	.051

DELIVERY, SHIPPING, AND PACKING.—8. The sheets shall be delivered in boxes of gross weight not greater than 220 pounds (100 kg.).

Specifications for Annealed Carbon Steel Forgings and Stampings

(65,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3s2; the steel has the following composition:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1035	0.30–0.40	0.50–0.80	0.045	0.050

MANUFACTURE.—3. *Heat Treatment.*—(*a*) All forgings or stampings shall be annealed.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reannealed.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	65,000	45.7
Minimum yield point	36,000	25.3
Minimum elongation in 2 inches or proportional gauge length	25 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings Without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings From Which a Tensile Test Specimen Can Not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

REFLECTION OF TEST SPECIMENS.—6. (*a*) *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

(*b*) *Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.*—Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat-treated with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Carbon Steel Forgings and Stampings

(80,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S2; the steel has the following composition:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1035	0.30–0.40	0.50–0.80	0.045	0.050

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings shall be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	80,000	56.2
Minimum yield point	60,000	42.2
Minimum elongation in 2 inches or proportional gauge length	22 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stamping Without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from Which a Tensile Test Specimen Can Not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. (*a*) *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test, unless a tensile test is specified for each forging or stamping.

(*b*) *Forgings or Stampings Weighing Less Than 5 Pounds (3.7 kg.), and of Suitable Section for Securing a Tensile Test Specimen.*—Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged rofm the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

(*Continued from page* 900)

FOREIGN NEWS

BELGIUM

A report from Amsterdam from Les Nouvelles says that President Wilson's message to Congress is being dropped on occupied areas in Belgium, despite Germany's threat to shoot as spies any aeronauts captured who have been engaged in such propaganda work.

The semi-official Wolff Bureau publishes a denial of the report that aviators are to be shot as spies, pointing out that President Wilson's message has received the widest publicity in Germany.

FRANCE

General Pershing has adopted the metric system for use on all maps for both horizontal and vertical distances. His order is as follows:

"All maps for the American forces will be prepared in metric units for both horizontal distances and vertical intervals with a system for locating points by metric co-ordinates as on the French maps, but with the addition of a scale in yards or miles and a conversion table from metric to feet. In the preparation of all operation orders the metric system will be employed for all linear measurements. The linear units of fire data for artillery will be expressed in meters. The range scale of all existing United States Field Artillery and of machine guns, both Infantry and anti-aircraft, will be regraduated in metric units. The sights of the Infantry rifle and of the automatic rifle will be left unchanged."

An airship recently flew from Paris to Algiers in eleven hours. The journey was accomplished without incident.

GERMANY

The *Lokalanzeiger* of Berlin contains a despatch from Munich announcing the death of Vice-Sergt. Max Muller. Muller was killed in fall resulting from engine trouble. It is stated that Muller claimed thirty-eight aerial victories.

A dispatch received in London from Amsterdam informs us that the Germans are reported to have constructed several huge underground hangars of concrete, at one of their principal Belgian aerodromes. The aviators start their engines underground and emerge from the shelters in full flight up long inclined planes. In returning, they alight on the inclined plane, down which the machine runs easily to the shelters. It is said that other similar hangars are under construction.

An unconfirmed report states that Germany is building experimental submarines designed to carry aeroplanes.

A Swiss engineer just returning from Germany states that German industrial machinery is breaking down. The shortage of lubricants, rubber and rare metals and the necessity of alloying steel is reducing the quality of machinery to such an extent that production is reduced and the lack of grease for lubrication aggravates the situation.

GREAT BRITAIN

An official communication issued on January 14th describes a daylight air raid against Karlsruhe, which resulted in diastrous fires, damaging the railway station and several munitions factories. The official announcement follows:

"Today our squadrons carried out a most successful raid into Germany in broad daylight, their objective being the railway station and munitions factories at Karlsruhe (about fifty miles from the French border). One and a quarter tons of bombs were dropped with excellent results. Bursts were observed on buildings and sidings of the main railway junction in the centre of the town, on railway workshops and a smaller junction in the town.

"Observers report a very large fire was started in factories alongside the railway, which was confirmed by photographs taken after the raid.

"The anti-aircraft fire was very heavy and accurate over the objectives and several hostile machines attacked our formation without success. All our aeroplanes reached their objectives and returned safely.

"Bombing and attacks with machine gun fire from low altitudes were carried out incessantly Sunday. Over four hundred bombs were dropped on a large ammunition dump near Roulers and on hostile billets, hutments and railway junctions. A party of the enemy engaged in extinguishing a large fire, attacked by machine gun fire, was scattered and the fire was left to run at will.

"In combats seven hostile machines were driven down out of control. Another was forced to land intact behind our lines by anti-aircraft fire. The pilot was captured. Three of our machines are missing.

"During Sunday night our night-flying machines dropped bombs on Roulers and Menin. All returned safely."

On January 15th, the British official announcement, a special section of which was devoted to aviation, reports still greater bombing successes resulting in damage to steel works and railroad centers. The report follows:

"Following upon the very successful daylight raid over Germany on Monday, another raid was carried out the same night, the objective of which was the steel works at Thionville, midway between Luxemburg and Metz, where a ton of bombs were dropped. A further half ton of bombs were dropped on two large railway junctions in the neighborhood of Metz.

"The anti-aircraft gun fire and searchlight barrages were considerable around the objectives. All our machines returned."

On January 15th the British official announcement detailing operations on the Palestine front shows that increased use of aeroplanes is being made on this front, and here, as everywhere, the aeroplane is rendering invaluable service. Enemy aerodromes have been bombed fifty miles north of Jerusalem, resulting in damage to railway stations and aeroplane bases. The official statement follows:

"Despite adverse weather conditions, our air service within the last few days has executed bombing raids on the enemy aerodrome at Jenin, thirty miles southeast of Haifa, and on the Amman station on the Hedjaz Railway, forty-seven miles northeast of Jerusalem. In each case many hits on the objectives were observed. Two of our machines are missing."

The London *Times* reports that the continued Allied air raids over Germany are awakening the people to a recognition of their rulers' mistaken ruthlessness, and that there is great nervousness throughout Germany, especially in the more exposed parts, owing to the reported intention of the Americans to invade Germany by air. The plans are discussed universally, and the press is unable to end the general anxiety by the statement that there is nothing to fear and that the air invasion reports are merely "American bluff."

The frequent explosions, the correspondent adds, are causing the German military authorities anxiety, not only because of the interference with the supply of munitions, but also because of unrest in the districts where the explosions occur.

Lyman H. Cunningham, Yale 1919, a second lieutenant in the British Royal Flying Corps, was killed in an aeroplane accident in England. No details have been received.

The organization of the Air Board is now nearing completion. Lord Rothermore has modeled his board on the Board of Admiralty. Its membership consists of a President and nine members. two of whom are responsible for staff work, one for personnel, two for production, two for equipment, one an administrator of works and buildings and a Parliamentary Secretary who will be a member of the House of Commons when the Air Minister is a Peer and vice versa. The Ministry of Munitions will appoint a Director-General of Aircraft Production.

All production and equipment of the British War Machine is concentrated in the hands of the Ministry of Munitions, and aircraft production is no exception. Secretary Baker has opposed such a policy for the United States, characterizing such a concentration impossible for one man, but the appointment of an Air Ministry in Great Britain has not caused any change in the policy of the Munitions Department.

Major and Brevet Lieutenant Colonel John Maitland Salmond, C. M. S. D. S. O., Royal Lancaster Regiment, Director-General of Military Aeronautics, in recognition of his distinguished services, has been promoted to Brevet Colonel by the authority of the king.

The British Government has decided to erect a large aeroplane factory in Ireland. Several aerodromes are now in the course of construction. These measures will serve to stimulate the national imagintion, and it is assumed that hereafter there will be no lack of recruits from Ireland for the flying service.

Restrictions on the manufactures of cotton, due to labor conditions and shortage of raw material, has resulted in unemployment of factories formerly engaged in this industry. The Cotton Control Board recently undertook to put these factories in operation for war purposes, and steps are being taken to utilize them for the construction and assembly of aircraft.

GREECE

Fliers of the Greek Naval Air Service have received medals for gallantry from England, in recognition of their bravery in bombing Turkish ships in the Bosphorus.

ITALY

The Italian official report issued January 13th states that Italian aeroplanes dropped one and a half tons of explosives on enemy magazines. British airmen brought down an enemy aeroplane.

On January 15th the official report from Rome announces the destruction of seven enemy aeroplanes, as follows:

"Four enemy aeroplanes were brought down by our airmen. Our artillery accounted for a fifth machine. Two other aeroplanes were downed by British aviators. In the afternoon seaplanes effectively bombed enemy forces in movement along the Lower Piave."

In describing operations on the Italian front on January 15th, the British official report states that during the past week British aeroplanes have destroyed six enemy machines and driven down others out of control.

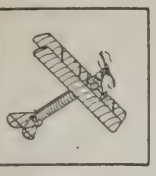
The Italian official announcement of January 16th reports the destruction of five enemy aeroplanes, as follows:

"There was considerable aerial activity along the entire front. British aviators brought down three enemy aeroplanes and our aviators brought down a fourth. Our anti-aircraft batteries accounted for a fifth."

In describing the air battles of January 15th on the Italian front, the Associated Press relates that Lieutenant St. Caroni, a noted shot, attacked a German machine at 12,000 feet. He crippled the machine at the third shot and put six shots in the head of the aviator and seven in the head of the pilot, the machine and its occupants tumbling in a dizzy spira.

Later Captain Zobail brought down another machine, which fell at Foza, just within the enemy line. Twenty Italians in the front trench, seeing the fall of the machine, sprang across the line, destroying the aeroplane, captured the aviator and pilot, and returned uninjured with their prisoners.

As recorded in AERIAL AGE several weeks ago, Lieutenant Brachpapa of the Italian Army Air Service rose to an altitude of 23,195 feet. We now learn that this flight was accomplished in one hour and three minutes, carrying one passenger, at Mirafioria, Italy. The machine used was an S. I. A. biplane, fitted with a Fiat six cylinder 300 horsepower motor, using a "Dixie" type Splitdorf magneto.



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

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Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
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TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
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Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Mr. H. Sibley's Gear-Controlled Model

"Since my last letter, *re* gear control model," writes Mr. H. Sibley, "I have tested the same, and below I outline the results obtained and certain improvements which have suggested themselves to me.

"1. One point of very bad design on my part soon made itself apparent, that is, in having the propeller shaft placed below the frame; the result causing a severe strain on the top wire, which needed constant attention. I have now refitted the propeller shaft midway between the bowed frame, the strain now being central.

"2. The chassis was also too weak for its work, and I am now fitting the same with a thicker gauge wire. It is necessary to have the chassis extra strong, as when testing the elevator control the machine is sometimes brought to earth in a very abrupt manner.

"3. With seven strands of ¼ strip rubber the model has ample power, and the wind resistance on the control is *very slight*, in fact, in calm weather, the machine could, I think, be got to fly on six strands.

"4. When testing the elevator control it is best to use the same at first with a very small angle (say 2°) to the horizontal, and gradually increase this until the best angle is found. I am now fitting my model with a smaller tail (12 ins. by 4 ins. semi-circular shape), but still using the same size flap.

"5. *Ailerons* are not necessary, the rudder being sufficient for turning. I found that the *ailerons* counteracted the effect of the rudder to such an extent as to cause a heavy resistance and consequent stalling of the model; if *ailerons* are used, the same should be of very small area.

"6. I am also fitting a larger gear wheel, viz., 1⅞ ins. diameter, 72 teeth. All control wires should be well protected against coming into contact with rubber.

"7. When launching into the wind, it is advisable to do so with the elevator at a positive angle. I still think that in calm weather the model could be got to climb in a more efficient way than is usual with the ordinary type of model.

"8. In windy weather I think the rudder is best left in one position, as the wind is a serious factor to be reckoned with, and machine is likely to get into difficulties. The model with improvements will be some ¾ oz. heavier, bringing the total weight to 6⅜ ozs.

"9. It is not necessary to set machine for 'stunt' flying (that is, when testing), as my own machine performed one loop, two tail slides, several vertical banks, also nose dives, all on its own, much to my delight(?).

"Summing up, the model when in flight has a very real and 'live' appearance. All controls answer readily, and I think altogether that the model is a step in the right direction."

Let us trust that our correspondent will not rest content until he has taken several more steps in the same direction.

Device for Self-launching Model

"I am a constant reader of the model section in AERIAL AGE," writes Mr. C. H. V. Ellis, Jr., "and I am sending you some notes of a self-launching model of my own construction; not having quite completed it, I do not exactly know its capabilities. I thought of it when reading a book entitled *Model Flying Machines*. It stated that the difficulty in the case of r.o.g. machines was the correct elevating of the same.

"If the elevator be inclined at a good angle so as to bring the model sharply into the air, it would continue to rise far too much and probably turn a somersault, instead of continuing in a horizontal flight. As you will see from the drawings, the chassis is sprung. The friction when the model is running on the ground presses the chassis on to the aluminium bracket, thus drawing in the controlling line and so causing the elevator to be tilted, as soon as the model rises, the spring pulls the chassis into its forward position, thereby slacking the line and allowing the rubber band to pull the elevator on to the aluminium nail.

"I should be pleased to hear what you think of this idea."

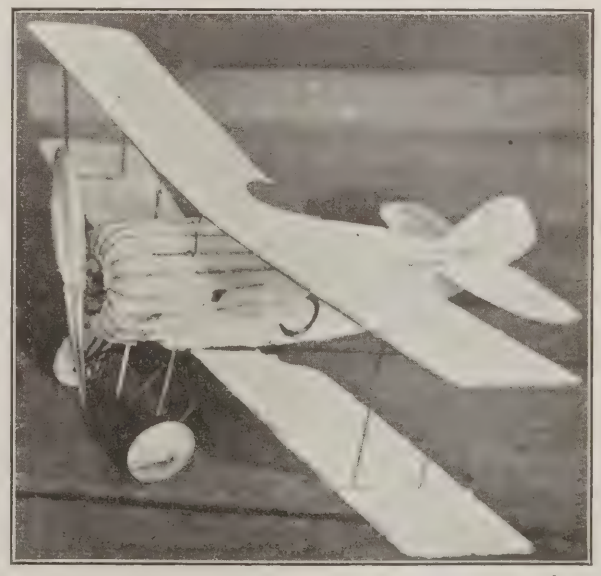
It is now well known that there is no need whatever for any such device as that which our correspondent is good enough to send us. The elevator is simply set at the correct angle for normal horizontal flight (approximately.. The first extra "burst" of the rubber motor is quite sufficient—often more than enough—to send the model well up into the air. Moreover, the model rises "naturally" by such means.

We have seen one or two somewhat similar devices to the above tried in practice, but the machine was more successful when they were done away with.

Mr. W. R. Sprague, Jr.'s Scale Model

The tractor biplane shown herewith was built by W. R. Sprague, Jr., of the Illinois Model Aero Club. Both wings have a span of 18 inches and a chord of 3¼ inches. The gap is 3½ inches; stagger, ½ inch, and both wings have a dihedral angle of about 2 degrees. The fuselage is 11 inches long and 3 inches in diameter at the nose. The over-all length from propeller to rudder is 14 inches. The propeller is laminated, 3 layers of Honduras Mahogany and 2 of White Pine. Its diameter is 6 inches; pitch, 9 inches. The chassis is of the Morane-Saulnier type, with 2 inch streamline disc wheels made of mechanical drawing paper. The machine complete weighs 1.13 ounces.

The model is slightly tail heavy, but flights of about 35 feet have been made in the open.



A cleverly constructed scale model that will fly. Designed and constructed by W. R. Sprague, Jr., of the Illinois Model Club



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

There is a good story going from mouth to mouth about the gas-driven cars which make London streets look very ugly just now. A young man home from the front said to his mother, "It makes me ill to see the blue funk London people get into about air raids. Fancy having mattresses on top of their motor-cars!"—*Daily Chronicle* "Office Window."

Flying low over the German lines, a British aviator was in the midst of a whining swarm of German bullets. The Germans in the trenches were firing straight up. The aviator —a cool youngster—looked down, saw a bullet slowly ascend its last few feet, but stop dead still for the smallest fraction of a second. The aviator reached quickly, grabbed the bullet and put it in his pocket.—*London Pall Mall Gazette.*



MAN—You'll never get your kite down that way. Why don't you use your head?

URCHIN—Aw, me neck ain't long enough!—Courtesy *Puck.*

Knew Something of Flying

"The American soldier in France and England has made a big impression among veteran officers and the people, and for the most part the same is true of the soldier boy in the training camps here, but there are exceptions, of course," remarked Capt. S. A. Dryer, a former member of the Illinois National Guard, who has been at the French front and knows numerous French and British officers, at the Willard. "For instance, not long ago I happened to be traveling on a train with a British officer. We were seated in the smoking compartment when a number of men dressed in the uniform of United States officers entered. One of them, a strapping fine-looking fellow, ostentatiously removed his overcoat and displayed the insignia which denoted that he was in the flying corps, but if the insignia had not shown it the man's remarks quickly impressed everybody. He monopolized the conversation and told how difficult it had been for him to become an expert.

"There was a smaller man seated in the compartment who had followed the officer's remarks without comment and had expressed no murmur of admiration, as other passengers had. He, too, was in the uniform of a French officer, but he had not removed his coat and displayed no marks of what arm of the service he belonged to. Finally the American youth, apparently nettled, turned to the stranger and asked:

"'Been "over there"?'

"'Yes,' laconically returned the man in French uniform, in perfect American English.

"'Well, I presume you don't know how difficult it is to learn how to fly,' went on the student aviator: 'you'll find out, perhaps, if you spend a few months in an aviation camp here. It's almost worth a man's life.'

"The young fellow, who was almost diminutive alongside the other, made no comment, but after a short time, as he got up, unconsciously his coat was turned aside, and there were seen decorations for bravery in the French flying corps, marks showing that he had been four times wounded, and other honor insignia. There was a painful silence for a moment, which was at last relieved by the abrupt departure of the man who had just been made a flyer."—*Washington Post.*

Then He Went Up in the Air

MANDY—"Rastus, you all knows dat yo remind me of dem dere flyin' machines?"

RASTUS—"No, Mandy, how's dat?"

MANDY—"Why becays youse no good on earth."—*Sun Dial.*

An American soldier in France was given a fork but no knife when he sat down to dinner in a French restaurant. He held up the fork and

"Camarade, camarade," he said.

"Ah, oui, oui," said the waitress, dashing off to the kitchen, to return with another fork.

Here was a poser for the soldier. He spent a moment in deep thought then beckoned to the waitress. With the air of a Christopher Columbus, he pointed again to the fork.

"Fiance, fiance," said he.

That time he got the knife.—*International Digest.*

Since the Germans have lost several Zeppelins, could you say that they were a Zeppel out?—*Curtiss Flyleaf.*

A story which reads like a dime novel was brought to light recently in England. In an air raid on London, a bomb striking a house, broke open a hidden cabinet in an old house, revealing a will which entitled the finders to something over five thousand dollars. It's an ill wind that blows nobody good!

The War Will Be Won In The Air

AEROPLANE MOTOR MECHANICS

NOW BEING TAUGHT AT THE MICHIGAN STATE AUTO SCHOOL

A course in Aeronautics has been established to train mechanicians for the Aviation Service. This includes thorough instruction and practice in building, running, and repairing aeroplane motors, repairing of planes and other parts; lectures in the theory of flying, history of aviation, construction of propellers, fuselage work, including metal fittings, bracing and wiring, wing construction, controls, landing gear and pontoons, and the care of the entire machine.

COMPLETE EQUIPMENT

By special permission, the necessary equipment for thorough instruction has been secured from the Curtiss Aeroplane Company. A Curtiss expert heads the faculty. He is an authority on aero-motors and aeroplanes, as well as hydros and flying boats. He is assisted by a competent staff of instructors, who have had over eight years of educational training along similar lines.

The Business of the Future

The men who become trained aeroplane motor mechanics now will be big men in the aeroplane business. Only a short time ago the automobile business was starting. The men who got in then are now the Big Men. The aeroplane business is in its infancy. The war will give it a **start. The men who** train now will be Big Men too. The work is extremely interesting and will grow in interest as the business develops. Aeroplanes and Seaplanes will be used for every purpose. Trained aero-motor mechanics will always be in big demand.



Opportunity for Service as Aeroplane Motor Mechanics

To those men who have the forethought to get into aviation work now, the coming years will be a period of glorious achievement, progress crowned by success, and the material rewards that go with success.

Get Into This New Industry Now

Glenn Curtiss, Orville Wright, the pioneers in flying—the men who had the remarkable insight and genius to perfect a heavier-than-air flying machine, are now the honored leaders in this new industry which seems to have sprung up over night. Within five years after the conclusion of the war, the aeroplane will be as firmly established as the automobile is today.

Students may enter our classes at any time. Write for further information, or come right to Detroit and start at once.

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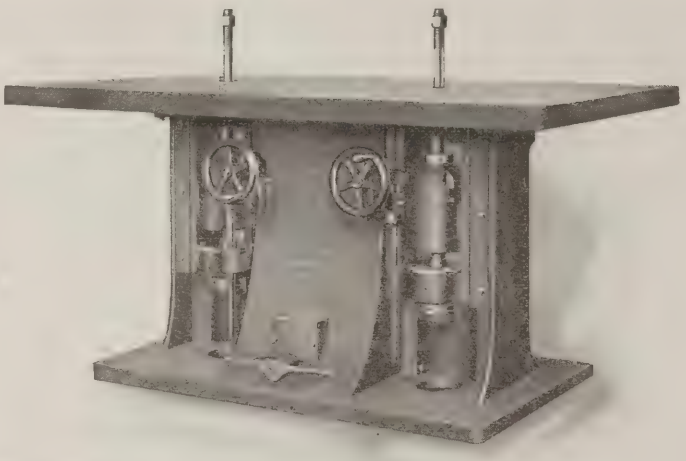
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Direct Motor-driven
Double Spindle Shaper

(*Continued from page* 895)

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Carbon Steel Forgings and Stampings

(95,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specifications 3S35; the steel shall have the following composition:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1045	0.40–0.50	0.50–0.80	0.045	0.050

MANUFACTURE.—3. *Heat treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	95,000	65.8
Minimum yield point	70,000	49.2
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) This test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured, shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat-treated with the lot which it represents

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible, shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Alloy Steel Forgings and Stampings

(100,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

(*Continued on page* 903)

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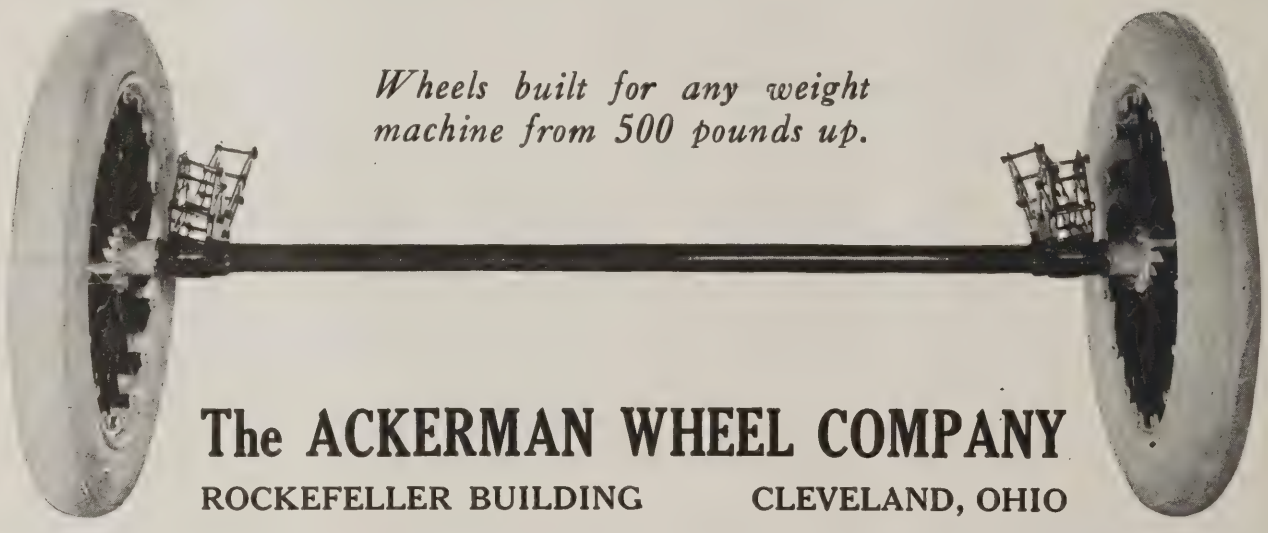
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Contractors to U. S. Government

(*Continued on page* 900)

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S3.

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	100,000	70.3
Minimum yield point	80,000	56.2
Minimum elongation in 2 inches or proportional gauge length	20 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

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(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

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D'Annunzio's Son Here to Build Caproni Biplanes

A commission from Italy headed by Hugo D'Annunzio, a captain in the Aviation Corps of the Italian army and a son of Gabriel D'Annunzio, the famed poet, has arrived in the United States with a corps of twenty-four mechanics and aeroplane experts from the Caproni factories in Milan. They are bound for Buffalo and Dayton, where the United States Government has Caproni planes under contract.

It is announced that Captain D'Annunzio will confine his work to perfecting the Caproni biplane, and not the triplane type which Lieutenant Resnati has used in his spectacular flights. The biplane has a carrying weight of five tons, including mechanics and bombs, and is equipped with three 200 horse-power motors which will make a speed of 162 kilometers an hour (or slightly over 100 miles an hour). Each machine is designed to carry two pilots, two observers, and possibly one bomb dropper.

"Italy now," said D'Annunzio, "is experiencing a great return to its original patriotic morale. We stopped the Germans when they were close to Venice, and we will hold them there until America comes to help us, as we know she will. Italy expects American aviators to join us, and we have already two schools there in which we are training them. There are many flyers wearing the American uniform now in Italy.

"My father, although beyond military age, is enthusiastic and will continue active to the end of this war. Not long ago he was up for nine and a half hours in a machine flying over the Austrian lines, which is a remarkable record."

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AERIAL AGE
WEEKLY

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A liner approaching the shores of France, being met by a French military dirigible balloon which signals the captain of the ship as to the safest course into port through the mine field.

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Aero Club Protests Against Reduction of Aviators' Pay

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AERO CLUB PROTESTS AGAINST REDUCTION OF AVIATORS' PAY

A PROTEST against the proposed legislation which has for its object the reduction in pay and rank of American aviators has been sent by the Executive Committee of the Aero Club of America to Secretary Baker, Senator Chamberlain, Chairman of the Senate Committee on Military Affairs; Congressman Hubert S. Dent, Chairman of the House Committee on Military Affairs; Major General George O. Squier, Chief Signal Officer, and Howard E. Coffin, Chairman, Aircraft Board.

Each of these authorities has been sent the following letter, signed by Mr. Alan R. Hawley, the President of the Club: "Dear Sir:

"A dispatch from France states that the American aviators over there are worrying over the report from Washington that there is legislation under contemplation intended to revoke the law granting the increase in pay for duty which requires constant participation in aerial flights.

"Kindly advise whether there is any such change under consideration, and whether there is any danger of its being adopted.

"We beg to submit the following facts to show that it would be very unwise and against the best interests of the United States and the Allies to deprive military aviators of their extra pay for flying duty:

"'(1) Aeronautics being still in its infancy, it has not been possible to define exactly what amount of clothing, instruments, books and other equipment a military aviator must have to make him efficient under war conditions. As a result, military aviators at present are only supplied by the Government with part of the equipment which they actually need to maintain their efficiency, and even their present salary is insufficient to meet their actual needs.

"'(2) The Aero Club of America has been co-operating with the patriotic Aviation Section of the National Special Aid Society and the Woman's Naval Service in arranging to supply the needs of military and naval aviators, and finds that the needs of each aviator, which are not met by the Government at present, total to several hundred dollars when the equipment is bought in the United States, and more when the equipment is bought in France or in England, where the prices are higher.

"'(3) There is no other branch of the Service outside of the Air Service where the individual—rather than the organization—is the fighting unit, and where the difference between victory and disaster depends so largely on the individual's well being and mental alertness.

"'(4) Lord Kitchener stated that an aviator is worth an army corps. We know that it takes an average of 100 hours of flying, at a minimum cost of $1.50 a minute, to make a military aviator; and that when an aviator crosses the fighting lines he and his aeroplane and equipment represent an investment of between $35,000 and $50,000. Having cost that much, we owe it to ourselves not to decrease his efficiency by decreasing his pay, and thereby depriving him of the means with which to pay for the extra equipment that he needs.

"'(5) We also know that the aviator's needs in clothing and equipment are large and the Government stops at bare needs and the aviator must pay for the costly equipment out of his pay. Of the hundreds of American aviation students sent to France, those who did not have independent means and whose pay did not permit them to purchase the clothing and equipment they needed had to sail without them. They hoped to purchase them in France after receiving their next pay, but they found the price prohibitive.

"'(6) It is hardly necessary to point out that a man numb with cold can make but little progress in training to pilot an aeroplane under war conditions and that being numb with cold he is more apt to misjudge distances and wreck his aeroplane in landing than he would be if he were comfortably dressed. Likewise a numb aviator cannot cope with a comfortably dressed enemy. Therefore, something should be done to meet more fully the aviators' needs, rather than to inflict further hardships by cutting down their pay.

"'(7) At present aviation officers of the Signal Corps and officers attached to the Signal Corps, while on duty which requires them to participate regularly and frequently in aerial flights, are entitled to an increase in the pay of their grade, under their commissions, as follows: Aviation officers, 25 per cent; junior military aviators, 50 per cent; military aviators, 75 per cent. Each junior military aviator and each military aviator duly qualified and serving has the rank, pay, and allowances of one grade higher than that held by them under their commissions, provided that the ranks under their commissions are not higher than that of captain.

"'(8) As their pay is barely sufficient, no changes should be made until the needs of military aviators are better defined and more completely met by the Government.

"'(9) It seems strange that America, the richest nation in the world, should be the first nation in all history to reduce the pay of any combatant force in the face of the enemy.

"'(10) Should this contemplated legislation go through, it will serve to dull, to a considerable extent, the enthusiasm of our fliers, and it will make our task a thousand-fold more difficult, as it will strike at the very heart of the Air Service organization and make almost impossible the development of the superior esprit de corps needed in the Air Service to maintain supremacy in the air.'

"We appreciate fully that this is one of hundreds of things that only those who are in close touch with aeronautics can understand, and that while the above mentioned reasons may have escaped the attention of those who proposed the change in the law, they may not escape your attention.

"Knowing the enormous pressure under which every department of the Government is working we would hesitate to add anything further for your consideration. But we feel that you will agree with us that this matter is of extreme importance.

"Assuring you again of the hearty co-operation of the Aero Club of America and constituent Clubs in the building of our Air Forces, I beg to remain,

"Yours very cordially,
"(Signed) ALAN R. HAWLEY,
"President, Aero Club of America."

President Forbids Holding of Aircraft Expositions

IN view of the many requests received from different parts of the United States by the Aircraft Board and the Council of National Defense by organizations asking support and approval of plans to hold aeronautic expositions, the President has issued the following proclamation:

Whereas a state of war exists, and the military and naval forces of the United States are endangered by enemy aircraft, and

Whereas this danger will be increased by communicating to the enemy the present state of aircraft invention in the United States, and

Whereas the holding of so-called expositions of aircraft is a method of collecting and distributing information to the enemy.

Now, therefore, I, Woodrow Wilson, President of the United States, by virtue of the authority vested in me by the Constitution and the laws of the United States, do hereby, for the protection of such forces, proclaim to all whom it may concern that, under the pains and penalties prescribed by the laws of war and the statutes of the United States, throughout the present war no exposition of aircraft shall be held in the United States or its possessions.

In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the District of Columbia this 1st day of January, in the year of our Lord 1918, and of the independence of the United States the 142d.

[SEAL.] WOODROW WILSON.

By the President:

ROBERT LANSING,
Secretary of State.

The Liberty Engine

(Editorial in *The Automobile*)

NO more suitable occasion could have been found for the unveiling of the Liberty engine than that of the meeting of the Society of Automotive Engineers in New York. Here were gathered together the men whose co-operation made possible the carrying out of the greatest task in the United States war program to date.

For weeks the public—as well as the engineering fraternity—have been eagerly waiting for some definite word as to whether the power plant which is to be the basis of America's air campaign is a success. It has been the greatest question in the minds of those who are impatiently waiting for progress toward the end of the war, and the answer was given on an occasion which may be truly set down as the most historic in the annals of the society.

With the auditorium and gallery of the most noted engineering gathering place in the country packed to capacity, three men who are responsible from the military, engineering and production standpoints respectively, laid bare the real facts in connection with the Liberty aviation engine. Then, after Col. V. E. Clark, Maj. J. G. Vincent and H. M. Crane had given the tactical, engineering and manufacturing reasons behind the engine, Major Vincent for a full half hour answered a rapid fire of questions covering every feature of the engine.

The Liberty engine is a success. It has been substantially indorsed by Europe in the shape of orders for large numbers of them, and when it finally carries the American flag over the battle fields of Europe we have every assurance that it will be as good an engine as has as yet been produced. The method by which it has been developed has been more than vindicated, and it is one of the brightest spots in the history of automobile and automotive engineering that all personal factors were forgotten in the harmonious, effective co-operation which resulted in the incorporation of the world's best ideas in the building of the Liberty engine in the short period of 21 days.

Speed Aviation

(Editorial in *N. Y. Times*)

IS the United States Government to be enmeshed and impeded in the spending of its enormous appropriations for war? We have the men, we have the materials, and we make plans that are excellent on paper for scope and detail, promising adequate results; but we move at a pace more pleasing to the enemy than to our allies. If the war is to last for years this tortoise progress will save democracy no doubt, but it must not be said that we struck too late.

These reflections are prompted by what Mr. R. R. Hearne, the British expert, has to say about the energetic preparations of Germany to command supremacy in the air during the present year in spite of the elaborate plans of the United States to mass so many planes in France that the eyes of the Germany Army will be put out and its bases and depots dismantled, so that it will be rendered incapable of resistance to a well-timed offensive by France, Great Britain, and the United States. Mr. Hearne speaks with enthusiasm about America's contribution to the air fleet of the Allies that cannot fail to end the war by shattering "the gigantic bundle of nerves known as the German railway system" and breaking down "the will of the governing classes who carry on the war":

It is in this matter of smashing Germany's nerves that America will bring invaluable aid to the Entente Powers by her thousands of aeroplanes this year. American experts showed great intelligence when they pronounced in favor of a gigantic air program, and if the United States delivers the goods, as I feel sure will be done, we shall have the most important instrument of victory against Germany.

Mr. Hearne's confidence in the ability of America to deliver the goods is flattering to our self-esteem, but it is patent that Germany counts upon our failure to build the aeroplanes and train the men to fly them in time for a great allied offensive in 1918. There is an impression abroad that we are making haste slowly. It seems to be justified by the generalities of the report of General Squiers and the reticence of those who would be prone to exult if big things were being done in better than record time. Making haste slowly will not win the war in the air.

Aeroplane Production

(Editorial in *N. Y. Times*)

WHATEVER may be the popular opinion of Fuel Administrator Garfield's order suspending business to relieve the coal situation, the wisdom of his rule exempting the aeroplane industry from the restrictions of his proclamation will be generally recognized. It would have been lamentable had the construction of aircraft been checked for a day, or even an hour.

We know now that we are not to have 100,000 planes in the air this year, nor anywhere near that number. In a recent statement Howard E. Coffin, Chairman of the Aircraft Production Board, exposed the futility of this hope, a hope based on the knowledge of America's industrial achievements of the past and the conviction that, in the building of weapons to strike Germany through the air, effort would be strained to the utmost.

The experience of our allies has shown that the maintenance of each machine at the front necessitates the employment of between forty and fifty men in auxiliary branches of the service, or an army of more than 4,000,000 in the aviation service alone, were this hope to be realized.

But the shock to us of this enlightenment was probably no shock at all to those who have looked, and still look, to us for help in destroying, once and for all, Prussian militarism. They could measure the probable success of our effort, and it was by this measure, rather than our hopeful prognostications, that they judged the share which henceforth we must bear in the task of destroying Germany's vision of world domination.

When England, France, and Italy called on us for aeroplanes and aviators their call was not for the numbers we pictured as soon winging their way from American hangars to blind the war eye of Germany. It was for the relatively fewer machines and pilots which their experience had taught them we could build and train. We are doing that. We have the word of Mr. Coffin that the program is progressing exactly on schedule, and it is a program devised after "international specifications for aircraft materials" had "been prepared under the direction of the Aircraft Production Board by a committee representing the allied countries" and after "a complete co-ordination of manufacturing facilities and policies had been agreed upon between the Allied Powers."

But we are accomplishing our task only by intensive and continuous effort. If our allies were not deceived into expecting more than we could provide, at least they have demanded of us all that it is humanly possible for us to give them, and the contract we assumed when we joined our fortunes to theirs is one that will permit of no interruption in operation. There is quite adequate occasion for satisfaction that the aircraft industry is to be spared the bewilderment and disorganization which Mr. Garfield has allotted to other activities.



THE NEWS OF THE WEEK



King Nicholas of Montenegro Awards Major Raoul Lufbery Medal of Valor

Friends of Major Raoul Lufbery, U. S. A. of Wallingford, Conn., the ace of the Lafayette Escadrille, have been wont to remark that he would soon be unable to move about by reason of the weight of the array of medals adorning his chest.

But King Nicholas of Montenegro thought differently, and, accordingly, as a mark of respect and admiration for Major Lufbery and the land of the latter's birth, he recently presented the intrepid pilot, who has accounted for seventeen German machines, with the Montenegrin Medal of Valor.

This decoration consists of a silver medallion, about the size of an American double-eagle, hanging from a tricolored—red, white and blue—ribbon.

Navy Calls for Binoculars, Spyglasses and Telescopes

In a communication from Franklin D. Roosevelt, assistant Secretary of the Navy, AERIAL AGE is requested to acquaint its readers with the needs of the Navy for binoculars, spyglasses and telescopes. The communication follows:

"The Navy is still in urgent need of binoculars, spyglasses and telescopes. The use of the submarine has so changed naval warfare that more "EYES" are needed on every ship, in order that a constant and efficient lookout may be maintained. Sextants and chronometers are also urgently required.

"Heretofore, the United States has been obliged to rely almost entirely upon foreign countries for its supply of such articles. These channels of supply are now closed, and as no stock is on hand in this country to meet the present emergency, it has become necessary to appeal to the patriotism of private owners, to furnish "EYES FOR THE NAVY."

"Several weeks ago, an appeal was made through the daily press, resulting in the receipt of over 3,000 glasses of various kinds, the great majority of which has proven satisfactory for naval use. *This number, however, is wholly insufficient, and the Navy needs many thousand more.*

"May I, therefore, ask your co-operation with the Navy, to impress upon your subscribers, either editorially, pictorially or in display, by announcing, in addition to the above general statement, the following salient features in connection with the Navy's call.

"All articles should be securely tagged giving the name and address of the donor, and forwarded by mail or express to the Honorable Franklin D. Roosevelt, Assistant Secretary of the Navy, care of Naval Observatory, Washington, D. C., so that they may be acknowledged by him.

"Articles not suitable for naval use will be returned to the sender. Those accepted will be keyed, so that the name and address of the donor, will be permanently recorded at the Navy Department, and every effort will be made to return them, with added historic interest, at the termination of the war. It is, of course, impossible to guarantee them against damage or loss.

"As the Government cannot, under the law, accept services or material without making some payment therefor, one dollar will be paid for each article accepted, which sum will constitute the rental price, or, in the event of loss, the purchase price, of such article."

Bosch Magneto Conference Concluded

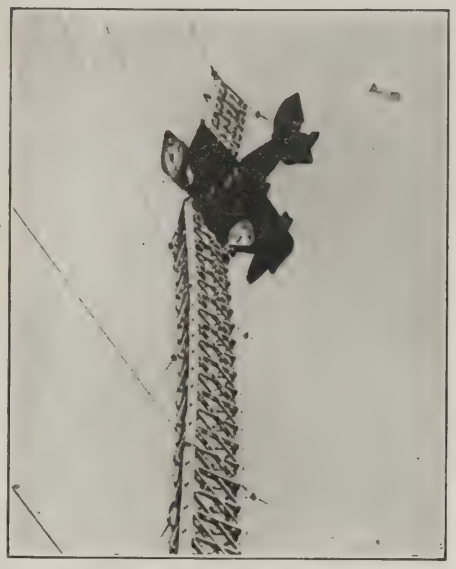
The Annual Sales Conference of the Bosch Magneto Company has just been concluded. Daily sessions were held at the executive offices in New York, and both main office and branch executives were highly optimistic concerning the outlook, especially in view of the present excellent position of the factory, in the matters of labor and material. Mr. F. D. Norman, superintendent, outlined the present favorable conditions obtaining at the works.

Aeromarine Solves Delivery Problem

The Aero-marine Plane and Motor Company, whose factory is located at Keyport, N. J., has obtained permission to ship its products to its various destinations, through the air. This permission is a clause in the five-year riparian license granted by the State Board of Commerce and Navigation. The Aeromarine Company is filling orders for hydroaeroplanes for the U. S. Navy.

As soon as a hydroaeroplane is finished, it can be sent into the air and right to the deck of the warship to which it will be attached. It will no longer be necessary to crate and pack its various parts, thus adding to the freight congestion.

The commendable initiative of the Aeromarine Company will doubtless result in a more general adoption of this method of delivery, and it paves the way for deliveries to our Allies in Europe, which it is hoped will soon be an accomplished fact.



British aeroplane in an unfortunate accident. The aviator was rescued after collision with a wireless tower by a sailor

French Tablet for U. S. Flier

French ambassador Jusserand advised Senator Overman, of North Carolina, that the French Government desires to place a bronze tablet on the monument erected at Carthage, N. C., to James R. McConnell, one of the first American aviators killed in France.



Tom Gunn and his wife, in America, to buy planes for the Chinese army

Edward M. Hagar Dead of Pneumonia

Mr. Eward McKim Hagar, president of the American International Steel Corporation, died at his home, No. 960 Park Avenue, of pneumonia, after a brief illness, in his forty-fifth year.

He was born in Salem, Mass., and was graduated as an engineer from the Massachusetts Institute of Technology in 1893 and from Cornell University in 1894. He formerly was president of the Universal Portland Cement Company, and a short while ago became president of the Wright-Martin Aeroplane Company, of New Brunswick, N. J. At the time of his death his offices were in the Equitable Building.

Mr. Hagar for many years made his home in Chicago, Ill. He was a member of numerous clubs, including the University, Riding, New York Yacht and Engineers, of this city, and the Union League, University, Onwentsia, Chicago Yacht and Western Society of Engineers of Chicago. He leaves his wife.

7,000 Men Wanted for Aviation Corps

Seven thousand men are needed by the Aviation Corps for immediate service behind the firing lines in France. Only men over and under the draft age are acceptable under this call, which is sent out by the United States Service Reserve. It is proposed to form a motor mechanics regiment, the first of its kind.

Skilled mechanics are desired most, but chauffeurs, blacksmith forgers, wheelwrights, cabinetmakers, sheet metal workers, cooks, canvas workers, house and sign painters, harnessmakers and acetylene welders will be accepted. The Public Service Reserve of the Department of Labor, which has undertaken to get these men for the Aviation Corps, says the men specified are urged to enlist at any recruiting station, but they should not give up positions in shipyards or war industry plants.

The recruits will be sent to Fort Hancock, Ga., for a short period of training, and will then be transported to France. Their work behind the firing lines will be of the first importance to the upkeep of the nation's aerial fleet.

Men Desired for Naval Air Service

The officer in charge of the Naval Recruiting Station, 34 East 23rd Street, New York City, will be glad to consider applications for enlistment in the Naval Air Service from candidates with the following experience:

(a) *Experienced engineers for engineer officers* at the various Naval Air Stations. These men will be commissioned in Class 5, and sent to Columbia University for further engineering training, and thence to Packard Motor Company, Detroit, for special instruction on Liberty engines.

(b) *Experienced gasoline engine men for further* instruction at Columbia University, and special instruction at Packard Motor Company on Liberty engines. These men will be given ratings in Class 5 in accordance with their qualifications.

(c) *Graduate mechanical engineers* and men of *experience along engineering lines* for special duty in Bureau of Steam Engineering, and in connection with work of this Bureau at various places. Such men will be commissioned immediately in Class 5.

(d) *Aeronautical and other gasoline engine draughtsmen for work in the Bureau of Steam Engineering.* These men will be given ratings of Chief Petty Officer and Petty Officer in Class 5, in accordance with their qualifications.

(e) *Men who have had experience in compressed gases, especially hydrogen.* A limited number of these men will be given commissions in Class 5, and others ratings in Class 5. These men will be used in connection with hydrogen generation for lighter-than-air-craft.

(f) *Mechanical engineers for special work under the Bureau of Construction and Repair.* These men will be used in connection with the development of aircraft. It is not anticipated that men of previous suitable aeronautical experience will be found, but it is desired to select the best material available and give them further training. Those suitable will be commissioned in Class 5.

(g) *Mechanical draughtsmen for duty in Bureau of Construction and Repair on aviation work.* These men will be given special aeronautical training, as needed. They will be given ratings of Chief Petty Officer and Petty Officer in Class 5.

(h) *Suitable men for training for Quartermasters* (Aviation) and *Carpenter's Mate* (Aviation) and such other specialists as are not covered by above subheads. Men for training as Quartermasters (Aviation) should be experienced in fabric work, wire working or any form of light rigging. For Carpenter's Mates (Aviation) boat builders are especially desired, but any men with woodworking experience will be considered.

It is desired that this letter be broadcasted throughout your District in order that such men as consider themselves qualified for any of the above duties may apply for examination. The time and place or places where these examinations will be held will be designated either by telegraph or by the Senior Officer of the Examining party.

Lieut. Thaw Opens America's Aerial War

To Major William Thaw, of Pittsburgh, goes the honor of being the first aviator in American uniform to fly over the German lines. According to reports received from France, Thaw, who was lately transferred from the French to the American air service, carried out numerous aerial patrols and, so far as is known, is the first American airman to go aloft under battle conditions.

Other members of the Lafayette Escadrille are expecting their new uniforms and will soon be flying in American service. They include Major Raoul Lufbery, Captain Robert Rockwell and Captain Dudley L. Hill.

Civil Service to Help Obtain Aviation Work Accountants

Positions as expert accountants to handle several hundred millions of dollars' worth of Government aviation purchases are open through the Civil Service Commission. Over 150 trained men must be secured at once, some of whom will be commissioned as reserve officers, while others will continue as civilians with salaries running from $2,400 to $6,000 a year. This is higher than any salary ever before attainable through Civil Service examination.

These men will form the second increment of an accounting force which already numbers more than 100 and which eventually will total more than 400. They are required for the administration of the cost plus system of contracts which has been adopted in the interest of starting immediate production in factories wholly inexperienced in aeroplane work, and in a field where no comparative costs or manufacturing experience has been available. Part of the men will be assigned to Washington, but the majority will be distributed among the various factories. The latter will check and approve all bills and will serve as a connecting link with the Government in the close business connections necessitated by the newness of the industry and the imperative need of haste.

Only the most experienced accountants who have had several years of actual experience, especially in public accounting or efficiency work, woodworking or machine shops, and who have held positions of responsibility and administrative importance are desired. Some of the best known accountants in the country, who have held positions with salaries running from $5,000 to $20,000 a year, are already in the service.

No written examination will be given, selection being based entirely on experience and education. Full details may be had from the United States Civil Service Commission at Washington or the Civil Service District Secretary at Boston, New York, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, St. Louis, New Orleans, Seattle, or San Francisco.

U. S. Employment Service Reports 13,500 Aeroplane Workers in New York State

The report of the survey of industries engaged in war work recently issued by the U. S. Employment Service, announces that the industries making the largest call for labor are those engaged in the manufacture of aeroplanes and seaplanes, which employ 13,474 persons.

Wisconsin Motor Mfg. Co. Now Capitalized at $1,000,000

With the increase in capital stock to $1,000,000, the Wisconsin Motor Mfg. Co. (Milwaukee) announces the completion of a large addition to the plant used mainly for the assembling of motors.

This addition includes a sub-assembly and final assembly department, in addition to a shipping department and stock room. Total floor space is 43,520 square feet. The assembly departments have a floor space of 28,003 square feet. The old assembly department has been converted into a machine shop. Also a brass foundry having 3,000 square feet of floor space has recently been erected by the company.

These new buildings quadruple the capacity of the plant. They are modern in every way—well lighted and well ventilated and fitted out with the most modern equipment.

A monorail system has been installed in the final assembly department. The motors are picked up from the assembly stands with electric hoists and conveyed direct to the testing department.

Each test stand has an individual motor generator unit. When a motor has been completed in the assembly room, it goes to the test room where it is run in with electric power until it is sufficiently free to run under its own power. After this it is run under full load for several hours. Then it is hoisted by an electric crane of the monorail type and taken to the final inspecting room. Here the motor is completely dis-assembled and all moving parts are thoroughly inspected and adjusted. Again the motor is placed on the test stand and is run several hours, after which it is ready to be shipped.

ANNUAL BUREAU OF STANDARDS REPORT

THE annual report of the Director of the Bureau of Standards transmitted to the Secretary of Commerce has the following items of aeronautical interest:

Balloon Gas Investigation

At the request of the Signal Corps and of the Navy Department the Bureau is investigating methods for the generation of hydrogen, making certain tests of the materials from which this gas will be generated and co-operating in the drafting of instructions for the personnel which will operate and maintain the field and service equipment. This work will include study of hydrogen generation and compression and the filling of balloons, both to prevent explosions and to maintain the highest operating efficiency feasible under service conditions.

Spark Plug Investigations

Work has been done in co-operation with the electrical division and with the Pittsburgh laboratories of the Bureau in an investigation of the causes of failure of ignition spark plugs in aeronautic engines, with a view to remedying the difficulties.

Study of the behavior of many different makes of spark plugs, both by laboratory experiments and service tests in an aeronautic engine, have in part led to the preparation and adoption of acceptance specifications by the Signal Corps. Tests are being made under these specifications at the Bureau.

Test samples covering the whole range of possible porcelain composition have been made up at Pittsburgh and are being tested for their thermal and electrical behavior.

Arrangements have been made for the construction of spark plug porcelain from the most promising of these compositions.

The temperature conditions to which spark plug porcelains are subjected are being investigated by direct temperature measurements in actual service with a view to devising means to meet satisfactorily the conditions of high temperature and extreme temperature gradients which occur in aeronautic engines.

Aeronautic Radiator Investigations

Work was started in May on an investigation of the relation between the geometric form of radiator cells and the cooling capacity and head resistance of radiators under varying conditions of air velocity and air pressure.

The program includes (1) a study of the fundamental laws of air flow and heat transfer in cellular types of radiators by means of measurements on all typical radiators now in use and other forms, which are necessary to complete the series of practicable cell dimensions; (2) application of the results to the design of radiator cell dimensions for maximum efficiency under various conditions of pressure and velocity; and (3) the establishment, if possible, of designs for standard radiator units which can be readily built and made interchangeable.

Equipment for this investigation, including a miniature wind tunnel with a section 20 cm. square, built within a vacuum chamber, has been substantially completed.

Installation of Aeronautic Engine Testing Laboratories

In co-operation with the Signal Corps, the Bureau has built a dynamometer laboratory comprising equipment for the testing of aeronautic engines up to 400 horsepower by means of an electrical dynamometer. A separate installation for running service and endurance tests of engines of practically any output is also under construction. In this latter installation, the engine is connected to a test propeller to permit the taking of observations on the effectiveness and durability of various devices and auxiliaries under service conditions. In both of these plants provisions were made for an accurate study of engine performance, by the application of means for measuring power output, fuel input, speed, heat balances, etc.

The object of this equipment is to provide a means of studying the fundamental elements of the design and operation of aeronautic engines with the immediate view of eliminating minor operation difficulties and improving the construction of aeronautic power plants, by furnishing reliable and accurate data.

One of the points to be determined by investigations of this character is the maximum compression ratio that can be used with safety in practice (this quantity determines the maximum power output that is attainable with a given type and size of engine). This work requires an exact knowledge of the behavior of spark plugs and ignition devices, as well as accurate measurements of the amount of heat which must be taken care of by the radiator system. Another important problem is the design of the radiator itself, an investigation of which is being made in co-operation with the National Advisory Committee for Aeronautics. The data hitherto available regarding the heat-dissipating capacity of given radiator designs have been inadequate to give designers a sure basis upon which to work. Another is the problem of proper lubrication of the aeronautic motor, both as to quantity, quality, operating characteristics, and the oils to be used, including the temperature at which those oils may be safely run. Still another is the effect of various fuels and carburetion systems and of different designs of intake and exhaust manifolds, all of which have a marked effect on the efficiency and reliability of the aeronautic power plant.

Testing of Aeronautic Engines Under Conditions of Reduced Atmospheric Pressure

In co-operation with the sub-committee on power plants of the National Advisory Committee for Aeronautics, the Bureau is building a laboratory for the testing of aeronautic

(Continued on page 945)



Signal Corps Aviation School "somewhere in America" © Committee on Public Information

NAVAL and MILITARY AERONAUTICS

Commander of Aeronautics Division Orders Tests for Special Aviation Work

That plans for greatly increasing the strength of the naval aviation service are about to be put in operation is shown by an order received yesterday by Commander Charles A. Adams, U. S. N., in charge of naval aeronautics in the Third Naval District, the headquarters of which are the Brooklyn Navy Yard. The communication received by Commander Adams was from Rear Admiral Leigh Palmer, Chief of the Bureau of Navation in Washington, and read as follows:

Officers from the department will within a short time report to you for the purpose of making a selection from the personnel of your district of men to equip for special work in connection with aviation as follows:

Experienced engineers for engineer officers at the various naval air stations. These men will be commissioned in Class 5 and sent to Columbia University for further engineering training, and thence to the Packard Motor Company, Detroit, for special instruction on Liberty engines.

Experienced gasoline engine men for further instruction at Columbia University, and special instruction at Packard Motor Company on Liberty engines. These men will get ratings in Class 5 in accordance with their qualifications.

Graduate mechanical engineers and men of experience along engineering lines for special duty in Bureau of Steam Engineering and in connection with work of this bureau at various places. Such men will be commissioned immediately in Class 5.

Aeronautical and other gasoline engine draftsmen for work in the Bureau of Steam Engineering. Ratings of chief petty officer and petty officer in Class 5, in accordance with their qualifications, will be given to these men.

Men who have had experience in compressed gases, especially hydrogen. A limited number of these men will get commissions in Class 5, and others ratings in Class 5. These men will be used in connection with hydrogen generation for lighter-than-air craft.

Mechanical engineers for special work under the Bureau of Construction and Repair. It is not anticipated that men of previous suitable aeronautical experience will be found, but it is desired to select the best material available and give further training to them. Those suitable will be commissioned in Class 5.

Mechanical draftsmen for duty in Bureau of Construction and Repair on aviation work. These men will get special aeronautical training, as needed. They will be rated as chief petty officer and petty officer in Class 5.

Suitable men for training for Quaratermasters—aviation—and carpenters' mates—aviation—and such other specialists as are not covered by the above subheads. Men for training as Quartermasters—aviation—should be experienced in fabric work, wire working, or any form of light rigging. For carpenters' mates—aviation—boat builders are specially desired, but any men with woodworking experience will be considered.

The time and the place where the examinations will be held will be announced within a few days.

Commissions and Promotions

To be Majors, Aviation Section, Signal Reserve: Morton Dale Stone, Norman Milton Roblee, Victor Clark Parker, Thomas Watkins Campbell, Jesse Coats, Richard S. Eskridge and Prince A. Oliver.

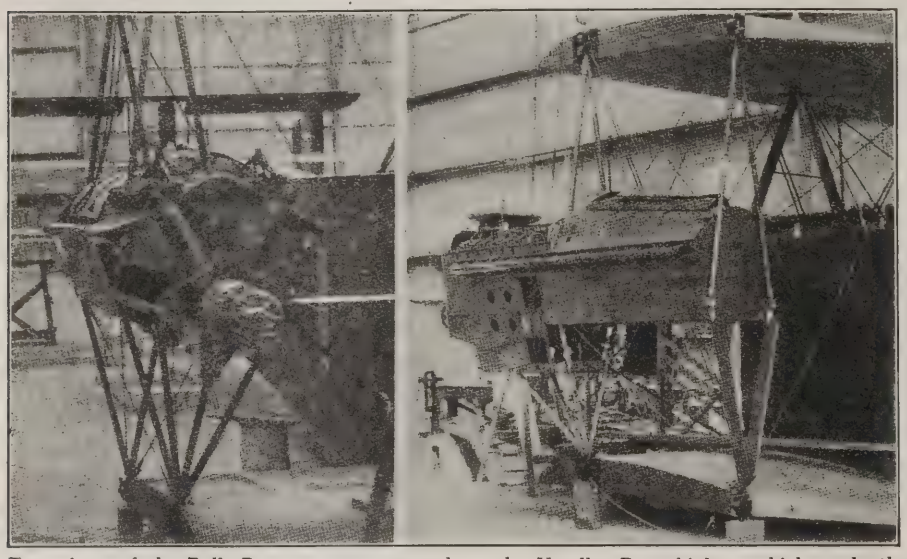
To be Captains, Aviation Section, Signal Reserve: Albert F. Bigelow, George L. Gordon, John E. Hays, Michael F. Owens, Reuben Miller, Jr., Jasper Whiting, Lee Wellington Oldfield, Frank G. P. Barnes, Francis E. Haag, Carleton Couch Hungerford and Alfred Willard.

To be First Lieutenants, Aviation Section, Signal Reserve: Elliot S. Church, Willis N. Coval, Sidney B. Dean, William Giles Morris, Paul R. Powell, Reginald Ronalds, Dan Walsh, Jr., Harold G. Schweser, Homer E. Whitney, Otho Leon Sifford, George Parke Miller, Frank W. Macomber, Wybro B. Griffiths, Charles E. Butner, William Phillip Bates, Edward Butts, Jr., Ernest A. Love, Harry B. Hartman, Edwin P. Craig, Daniel Crawford, Nicholas E. O'Connor, Hugh Brewster, Cornelius H. Caddagan, Wilson S. McClintock, William J. Hoover, Robert Stroud Houston, Donald Hudson, Jason Solon Hunt, Clayton Coskey, Ingersoll, John Caesar Kennedy, Charles Ingoldsby McLean, Foster George Marshall, John Carlisle Miller, Zenos Ramsey Miller, Thomas Louis Moore, Thomas Joseph O'Brien, Frederick Ira Ordway, Jr., William Herman Pearcy, Sam Pickard, Henry Pointer, Robert Fulton Raymond, Karl John Schoen, William Henry Spindle, Harlan Randolph Sumner, William Wright Tanney, Frank Hopewell Underhill, Jerry Cox Vasconcells, Gibson G. Wolfe, Clayton Lawrence Bissel, Stephen Thurston Calfin, Wallace Angus Coleman, John Joseph Curtin, Herbert Earl Eckart, Claude Stokes Garrett, George Preston Glenn, John H. Gose, Jr., Alfred Alexander Grant, Julius Elmer Gregory, Malcolm Beugless Gunn, John McQueen Hayward, Robert E. Hill, Maurice MacGregor Kidd, Clifford Addison McElvain, Richard Charles Martin, LeRoy Jerome Prinz, Edward Walter Rucker, Hamilton F. Benjamin, William W. Charles, Charles K. Clinton, Quentin F. Feitner, William Greene, Edward Buck Hamer, Herbert G. Kubel, Charles W. Lewis, Frederic E. Luff, Edward C. J. McShane, Alfred M. Wright, Andrew B. Berger, Henry A. Brandtjeh, John F. Brown, Joseph St. George Bryon, William E. Feust, Leigh D. Guyer, Harry H. McDaniel, Richard S. Merrill, Harry Secord, Charles F. Underwood, Alpheus C. Bemis, Walter J. Enright, William B. O. Field, Roy D. Harris, Eugene Arthur Hults, Roland L. Hustis, Donald G. Keeble, John Garfield Milburn, Elmo Meale Pickerill, William W. Riegel, Ralph S. Whittle, Thomas Emmett Kearney, Edwin Carlyle Klingman, Gordon Woorhees Moy, Murray Kenneth Spidle, Lowell Kahler Weaver, Philip Earl West, Charles Edward Whitehouse.

To be second lieutenants, Aviation Section, Signal Reserve: Peter F. Allan, Ft. Omaha, Neb.; John A. Allen, Army Balloon School, Ft. Omaha, Neb.; Martin H. Andrews, Army Balloon School, Ft. Omaha, Neb.; Howard B. Blanchard, Army Balloon School, Ft. Omaha, Neb.; Forrest D. Bradshaw, Army Balloon School, Ft. Omaha, Neb.; Don Cameron, Army Balloon School, Ft. Omaha, Neb.; Edgar R. Case, Garden City, L. I., N. Y.; Sydney Welby Caulfield, Trego Motors Corp., New Haven, Conn.; Philip B. Chase, Army Balloon School, Ft. Omaha, Neb.; Charles A. Chalaron, Kelly Field, San Antonio, Tex.; Alexander G. Churchward, 23d Engrs., Camp Meade, Md.; Frank H. Clewers, First St., Tippicanoe City, O.; Glenn S. Cobb, 8 Central Pl., Toledo, O.; Edward E. Denniston, Army Balloon School, Ft. Omaha, Neb.; Robert L. Dillenback, Harrington Hotel, Washington, D. C.; Wilbur H. Downs, Kelly Field, San Antonio, Tex.; James H. Ferguson, Army Balloon School, Ft. Omaha, Neb.; Cleves S. Fisher, Army Balloon School, Ft. Omaha, Neb.; Edward M. Gallagher, Army Balloon School, Ft. Omaha, Neb.; Grosvenor E. Glenn, Army Balloon School, Ft. Omaha, Neb.; Claude E. Grieder, 119 D St., N. E., Washington, D. C.; Milton W. Griggs, Kelly Field, San Antonio, Tex.; William H. Hamilton, Kelly Field, San Antonia, Tex.; Clyde B. Hamlin, Kelly Field, San Antonio, Tex.; Vincent J. Hoye, Army Balloon School, Ft. Omaha, Neb.; Robert V. Ignico, Army Balloon School, Ft. Omaha, Neb.; Lester Clyde Lichty, Engr. Officers' School, San Antonio, Tex.; Christian H. W. Luecke, Kelly Field, San Antonio, Tex.; Travis S. Masterson, Kelly Field, San Antonio, Tex.; Joseph Matheison, Kelly Field, San Antonio, Tex.; David M. Osborne, 256 Union Station, Washington, D. C.; Clarence J. Prendergast, 1858 Lakeview Rd., Cleveland, O.; Bert Robertson, 408 Sheppard St., N. W., Washington, D. C.; Chester J. Sharp, Army Balloon School, Ft. Omaha, Neb.; George P. Shillinger, Kelly Field, San Antonio, Tex.; Clarence L. Solomon, Garden City, L. I., N. Y.; John M. Thompson, Jr., Kelly Field, San Antonio, Tex.; Miller S. Tyson, 3001 Tusc St., W., Canton, O.; William E. Woodman, Army Balloon School, Ft. Omaha, Neb.; A. E. Boudreaux, Henry L. Brownback, Arthur M. Culpepper, Rush F. Crouse, Harry L. Hind, Roy L. Johnson, Joseph S. Kimball, Willard S. Putnam, Justin P. Quirk, Harold Rosenfeld, Leo C. Shippey, Floyd G. Slentz, Floyd A. Taylor, Norman H. Wright, Clarence N. Walker, Edward C. Bockstahler, Howard H. Crowell, Arthur L. Draper, Adrian K. Forney, George William Hansen, Edward W. Kiesewetter, Herluf A. Knudsen, Felix R. Roche, Robert W. Shauck, Oliver M. Smart, Victor C. Sweinhart, William Tobian, Henry D. Valentine, William M. West, Benjamin C. Young, Edward L. Bullock, Jr.; John J. Carroll, Walter A. Churchill, Abe W. Cohen, Merlin F. Crutcher, James L. Davitt, Murray T. Donoho, Robert G. Elbert, Francis E. Engebretson, Charles M. Foster, Willis F. Geib, Francis J. Good, Denison D. Grant, Frederick Kuhne, Paul L. Lockwood, Donald B. Macdonald, Olen W. Noel, Edward D. Norment, Walter James Philip, Aaron Prussian, Ernest L. Richardson, Fred Seebick, Bernard W. Shir-Cliff, Reuben B. Sleight, Edson S. Smith, Hyland P. Stewart, Jr., William H. Thurston, Jr.; George W. Vierling, Francis Byron Wasserboehr, Charles Howard La France, Willard Earl Dickinson, Edwin



Motorcycle experts are welcome in the Air Service. They are a vital part of the flying branch of the army



Two views of the Rolls-Royce motor mounted on the Handley-Page biplane which made the London to Constantinople flight British Official Photo

F. Atkins, Jr., Allen E. Bardwell, Isaac W. Baugh, James H. Bay, Joseph J. Bourgoine, Thomas P. Breen, Henry S. Bryant, Holland M. Cassidy, Zenas Crocker, Jr., Marion O. Dunning, Edmond Hurst, Charles R. Jarratt, Norman L. Kilcup, Lawrence W. Kinnear, Will Leach, George E. Marshall, Thornton C. Pray, Donald B. Regester, Charles M. Smith, William Rufus Toston, Charles G. Van Alstyne, Onno V. Walters, Marshall H. Ward, Edward E. White, Claude E. Wickizer, Leo Yassenoff, William L. Allen, Wallace M. Allison, Donald B. Banks, James D. Cassels, Earl W. De Nio, John W. Denison, Joseph French Dixon, Roy W. Foster, Edgar F. George, Victor H. Johnson, James A. Kennedy, William H. Knowles, Silas Laws, John Frederick McCarthy, John B. McMahon, Charles E. McSherry, Lester F. Merrick, Glenn T. Ross, Tom M. Starnes, Andrew Wade, Paschal Williams, Irving K. Wolfe, Edmund C. Wright, Sergt. Russel Clark, Sergt. Harry E. Ralcliffe, Sergt. Ira B. Vanocker, Private First Class Robert C. Aulmann, Private First Class George M. Bent, Private First Class Herman G. Brady, Private First Class John J. Byrne, Private First Class Harry H. Catching, Private First Class Edwin H. Christena, Private First Class Percy F. Crane, Private First Class Paul Bowen Cromelin, Private First Class Richard Currier, Private First Class Charles V. Daiger, Jr.; Private First Class Earl David, Private First Class John M. Devers, Private First Class Kenneth W. Dick, Private First Class Daniel Louis Dwyer, Private First Class Harold Flack, Private First Class Charles T. Gilbert, Private First Class George H. Hannum, Private First Class Ernest S. Hansberger, Private First Class William H. Hine, Private First Class Charles W. Kempter, Howard Clark Babcock, Maurice B. Baldwin, Carl A. Birdsall, Harold V. Cahill, James G. Clark, Alfred J. Diebel, Paul Edwards, William L. Fox, Falk Harmel, Dennis D. Holtz, Sidney Isaacs, Glenburn M. Jones, Thomas Edward King, Walter Burke McConnell, Kenneth A. Moore, John Arthur Newcomb, Hilliare F. Nitchke, Raymond C. Pierce, William T. Rice, William Ezra Scarboro, Howard T. Snedicor, Samuel M. Stouffer, Walter L. Vail, John E. Walters, Jr., Paul D. Weathers, Merlin F. Crutcher, Abe W. Cohen, John Joseph Carroll, Walter A. Churchill, James L. Davitt, Murry T. Donoho, Robert G. Elbert, Francis J. Good, Paul L. Lockwood, Olen W. Noel, Edward D. Norment, Aaron Prussian, Ernest L. Richardson, Bernard W. Shir-Cliff, Edson S. Smith, Hyland P. Stewart, Jr., George William Vierling, Auguste E. Boudreaux, Henry L. Brownback, Rush F. Crouse, Harry L. Hind, Roy L. Johnson, Arthur M. Culpepper, Joseph Stickney Kimball, Willard S. Putnam, Justin P. Quirk, Harold Rosenfield, Leo C. Shippey, Floyd G. Slentz, Floyd A. Taylor, Norman H. Wright, Clarence N. Walker, John Baxter, Wade H. Bunting, James W. Cuff, Clifford J. Doheny, William A. Elliot, Charles P. Harrington, Roy H. Murrow, Kenneth G. Price, Dem Rust, Warren F. Scribner, Walter J. Staley, Robert Steinberger, Henry S. Sturgis, S. Donovan Swann and Harris E. Willingham.

Special Orders 8-9

Capt. Robert Howlett, to report to the Chief Signal Officer.



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Visiting delegates from New Orleans, La., at aviation field, Bourget, France

Second Lieut. Herman G. Grueger, to report to the Chief Signal Officer.

First Lieut. Harold Richard Kelly, on duty to participate frequently in aerial flights.

First Lieut. Grenville L. Hancock, to report Scott Field, Belleville, Ill.

Second Lieut. Harvey Hodges Holland, to report Balloon School, Fort Omaha, Neb.

First Lieut. James G. Hall, to report Garden City, N. Y.

Appointment of Theron S. Duby as first lieutenant announced. Placed on active duty and will report to the Chief Signal Officer.

Second Lieut. William G. O'Fallon, to active duty and report to the Chief Signal Officer.

Second Lieut. Tom Barry Miller, to active duty, and report to Dayton Wright Airplane Co., Dayton, Ohio, for duty.

The appointement of Private First Class Ira Ford Fuller as first lieutenant. Report to Love Field, Dallas, Tex.

First Lieut. Walter Jessee, proceed to Portland, Ore.; report to Col. B. P. Disque, Yeon Building, for duty.

First Lieut. John M. Galt, report to Door Field, Arcadia, Fla.

Second Lieut. Harold C. Brown, to office of the district manager of inspection, Buffalo, N. Y., and report by wire to the Chief Signal Officer of the Army.

First Lieut. Gardiner F. Greene, report to aviation supply depot, Garden City, L. I., N. Y.

Second Lieut. Alfred C. Bame, report Langley Field, Hampton, Va., for duty with the construction division.

First Lieuts. Walter A. Lorah and Wendell H. Kindred, Scott Field, Belleville, Ill.

First Lieut. Thomas J. Hilliard, Aviation Section, Signal Reserve Corps, will proceed to Dayton, Ohio, take station, and report by telegraph to the Chief Signal Officer of the Army for assignment to duty.

First Lieut. Francis Dean Schnacke, to report to the Chief Signal Officer.

First Lieut. Earl F. Stewart, on duty requiring him to participate regularly and frequently in aerial flights.

By direction of President, First Lieut. Bert C. Miller, is discharged from the service of the United States.

The following named officers of the Aviation Section, Signal Corps, are rated as junior military aviators, to date from December 2, 1917, under the provisions of paragraph 6 of the Act of Congress, approved July 24, 1917: Maj. Harold E. Hartney, Maj. Lawrence C. Angstrom, Maj. Cedric A. Bourne.

The following named officers will report in person to McCook Field, Dayton, Ohio: First Lieut. Lester F. Ream, First Lieut. Earl C. McGee, First Lieut. Roy W. Howell, First Lieut. William P. Fitch, First Lieut. Meyers B. Horner, First Lieut. Luther W. Kieler, First Lieut. Stanley B. Marks, First Lieut. Oscar P. McCord, First Lieut. Dan Babcock.

Second Lieut. Herbert N. Koons will report to Hazelhurst Field, Mineola, L. I., N. Y.

Capt. Samuel Anable will report to the Chief Signal Officer.

The following named officers, Aviation Section, Signal Reserve Corps, will report to Kelly Field, San Antonio, Tex.: Second Lieut. Bert McNeil, Second Lieut. John William Slattery, Second Lieut. Robert A. Weinhardt, Second Lieut. Frederick H. Pearson, Second Lieut. Ernest G. Thornton, Second Lieut. Austin T. Quick, Second Lieut. Charles B. K. Gillett, Second Lieut. Frederick Walter Griffiths, Second Lieut. Morgan Belmont.

The following named first lieutenants will report to Gerstner Field, Lake Charles, La.: Wiley R. Wright, John U. Wegener, Richard Anderson, Manfield F. Arnold, Edmund T. Allen.

First Lieuts. George C. Johnson and James W. Lavers will report to the Army Balloon School, Fort Omaha, Neb.

First Lieuts. George L. Crosson and Clarence M. Bellows will report to aviation supply depot, Garden City, L. I., N. Y.

The appointment of the following named men to the grade of captain, Signal Sorps, Regular Army (temporary), with rank from December 24, 1917, is announced: Corpl. Joseph Boyarsky, 18th Infantry; Corpl. Donald W. Rowan, 18th Infantry; Corpl. Henry M. Jeffries, 18th Infantry; Mess Sergt. Andrew B. Hawkins, 18th Infantry; Sergt. Oscar E. Hembree, 18th Infantry; Sergt. Horace K. Mann, 18th Infantry; Sergt. Everett E. Simmons, 22d Infantry; First Sergt. Joseph C. Neff, 18th Infantry; Sergt. George A. Norris, 18th Infantry; Sergt. Robert P. Oldham, 18th Infantry; Sergt. Hans C. Rasmussen, 22d Infantry; Sergt. Frank Connell, 18th Infantry; Sergt. Robert A. Nelson, 18th Infantry; Supply Sergt. Frank Ondrieck, 17th Infantry; Sergt. Henry W. Mann, 17th Infantry.

Promotion of Lieut. Col. J. B. Douglas, Signal Corps (temporary), to the grade of colonel, Signal Corps (temporary), with rank from January 9, 1918.

Special Orders 10.

The appointment of Private First Class Herbert Ed. Harwood as second lieutenant, Aviation Section, announced, and report to the chief of air personnel, office of the Chief Signal Officer, Washington, D. C.

The appointment of Private First Class William Beaumont McLaren as first lieutenant. Will report to Rockwell Field, San Diego, Cal.

The appointment of Edward Wilcox Huber as first lieutenant, and will proceed to Chief Signal Officer.

The appointment of Clarence Roy Sigwalt as first lieutenant, and will report to the Chief Signal Officer.

Second Lieut. Charles W. King, Aviation Section, Signal Reserve Corps, will report to the Chief Signal Officer of the Army.

First Lieuts. James L. Edwards, Frank W. Fisher and William J. Blackman will report to aviation general supply depot, Garden City, L. I., N. Y.

Second Lieut. Edwin H. Fox will report to the Chief Signal Officer.

The appointments of the following named members of the Signal Enlisted Reserve Corps as first lieutenants, Aviation Section, Signal Officers' Reserve Corps, are announced: Master Signal Electrician Bernard Henry Spelbrink, Private First Class Robert Moulton Briggs, Private First Class Franklin Clay McGaughy, Jr., Private First Class Felix T. Smith, Private First Class Victor Behling Westphal, Private First Class Paul Kirkwood Yost, and will report to Post Field, Fort Sill, Okla.

Second Lieut. Clark Goodell Mitchell, report to the Chief Signal Officer.

The appointment of Private First Class Wesley J. Hunt as first lieutenant, and will report to Kelly Field.

Second Lieut. Stanley Miles Weiland will report to aviation concentration camp, Mineola, L. I., N. Y.

Second Lieut. Robert Milne will report to the commanding general, Northeastern Department, for assignment to duty in the Pigeon Section of the Signal Corps.

The appointment of Private First Class Charles F. Curry, Jr., as second lieutenant, and will report to Kelly Field, San Antonio, Tex.

The appointment of Ben Currier Herschfield as first lieutenant, and will report to the Chief Signal Officer.

The appointment of Milton Earl Heck as first lieutenant, and will report to the Chief Signal Officer.

The appointment of Richard Clare Hanna as first lieutenant, and will report to the Chief Signal Officer.

By direction of the President, the following named officers are detailed temporarily as majors in the Signal Corps, under the provisions of an Act of Congress approved July 24, 1917: Maj. Frederick G. Phelps, Infantry; Maj. Elbe A. Lathrop, 35th Infantry; Maj. John G. Thornell, 41st Infantry; Maj. Robert Coker, 60th Infantry. The officers named will proceed at once to Camp Hancock, Augusta, Ga.

The appointment of Henry Clinton Shoemaker as first lieutenant, and will report to the Chief Signal Officer.



Only one of the many buildings being erected "somewhere in America" to provide training quarters for aviators © Committee on Public Information

Maj. Charles McFadden Hall, Signal Corps, will report in person to the Chief Signal Officer of the Army for temporary duty, and upon the completion thereof will proceed to Dayton, O., take station there, and report by wire to the Chief Signal Officer of the Army for duty.

First Lieut. Frank W. Fisher will report to aviation supply depot, Garden City, L. I., N. Y.

Capt. Edgar H. Sorensen will report to Col. B. P. Disque, Yeon Building, Portland, Ore.

Capt. Fred M. Green, Coast Artillery Corps, will proceed to McCook Field, Dayton, Ohio, and report to Lieut. Col. Virginius E. Clark, Signal Corps, for duty.

First Lieut. John Perwitt Nelson will report at Camp Taliaferro, Hicks, Tex.

First Lieut. Ernest B. Tracy, Aviation Section, Signal Reserve Corps, is assigned to active duty and will report in person to the Chief Signal Officer of the Army for duty.

First Lieut. Harvey N. Pye, will proceed to Toronto, Canada, and report to Lieutenant Lowe, Alexandria Apartments, University Avenue.

The appointment of Private First Class William R. Kiefer as second lieutenant, and will report to the chief, Air Personnel Division, office of the Chief Signal Officer.

A board of officers to consist of Capt. Henry Irving Brock, Aviation Section, Signal Reserve Corps, and Contract Surg. Edmund Moss, is appointed to meet at New Orleans, La., for examining applicants in the Aviation Section.

The appointment of George Roy Lipe as second lieutenant, and will report to the Chief Signal Officer.

First Lieut. James Carey, Signal Corps, report to Camp Sevier.

First Lieut. Howard Rogers will proceed to Morrison, Va., and report to aviation concentration camp.

Second Lieut. Mark H. Redman will report to Post Field, Fort Sill, Okla.

The appointment of Reginald Clayton Gardner as second lieutenant. Report in person to the Chief Signal Officer.

The appointment of Ernest Young as second lieutenant. Report in person to the Chief Signal Officer.

First Lieut. Clarence A. Phillips. Report to the Chief Signal Officer of the Army.

First Lieut. Oliver P. Gothlin, proceed to Fort Sill, Okla. Report to the commanding officer, Post Field.

Capt. Henry Irving Brock will report to the aviation examining board, 104 Broad Street, New York, N. Y., and later to New Orleans, La.

Second Lieut. Harry H. Cobe, and will take station at the Wright-Martin Aircraft Corporation, New Brunswick, N. J.

Second Lieut. Benjamin King will report to Col. B. P. Disque, Yeon Building, Portland, Ore.

The appointment of Earle Davis Seaverns as first lieutenant, Aviation Section. Report to the Chief Signal Officer

Appointment of Charles Otis Priddy as second lieutenant. Will report to the Chief Signal Officer.

The appointment of Frank Allen Osburn as second lieutenant. Report to the Chief Signal Officer.



Napier aeroplane motors ready for delivery.—Courtesy "Autocar" British Official Photo

"La theórie en Aviation doit être enseignée non par de ingénieurs de laboratoire, mais par ceux qui conçu et realisé les meilleurs appareils, car, en Aviation, la théorie même tient encore de l'empirisme: elle est de l'emprisime scientifique" ROLAND GARROS.

AEROPLANE CONSTRUCTION IN GENERAL

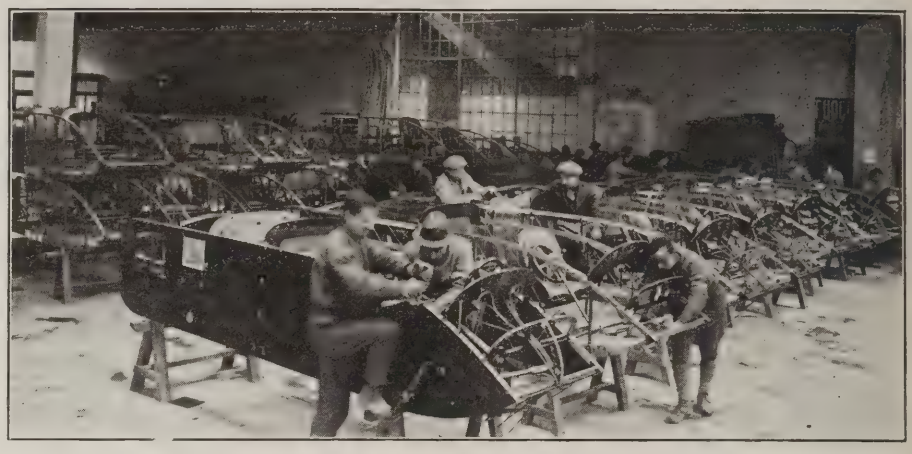
By OTTORINO POMILIO

PART II—THE CONTROL GEAR

THE equilibrium of the aeroplane in flight must always be referred to its center of gravity. The line of flight of the aeroplane is the line of flight of its center of gravity.

Like every solid, the aeroplane has three principal axes. Two of these are in the plane of symmetry. The third passes through the center of gravity and its perpendicular to the plane of symmetry. Any rotation of the machine about its center of gravity may be considered as having been obtained by successive rotations about the principal axis. Vice versa, if we dispose of controls capable of giving the aeroplane rotations about any of the principal axes, we can bring about or prevent any deviation of the machine whatever.

We will call the principal axis perpendicular to the plane of symmetry the pitching axis. Rotations about this axis may be termed as pitching movements affecting the "longitudinal stability" of the machine. The axes in the plane of symmetry are perpendicular to each other, and may make any angle whatever with the line of flight. We will consider that particular case—which is the most common in actual practice—where one of these axes is parallel to the line of flight and the other is perpendicular to it. The axis parallel to the line of flight is also known as the rolling axis, and rotations about this axis affect the "lateral stability." We will refer to the axis perpendicular to the line of flight as the axis of direction of flight. Any movement about that axis affects the direction of flight.



Pomilio Aircraft Factory. The installment of the control gear

Controls For Longitudinal Stability

Any movement of rotation about the pitching axis is brought about or prevented by means of the "horizontal rudder" or "elevator." This is a surface of small area, in the longitudinal axis of the machine, and at a certain distance to the front or rear of the center of gravity. Normally this surface is parallel to the line of flight so that there is no air reaction acting on it; but it is hinged so that it can be made to assume a positive or negative angle of incidence. The air reactions thus produced form about the pitching axis the couples required for up and down movements.

The effectiveness of the elevator depends on various factors. Let G be the center of gravity (Fig. 1), l the distance of the elevator from the center of gravity. If the elevator is turned up by an angle i' a force f' is developed and

$$f' = K' s_1 V^2$$

where s_1 is the area of the rudder surface and V the velocity of the aeroplane. The moment about the pitching axis will be:

$$M' = f' l' = K' s_1 V^2 l'$$

For "the rudder turned down at an angle i''

$$M'' = K'' s_1 V^2 l''$$

Generally the two faces of the elevator are symmetrical,

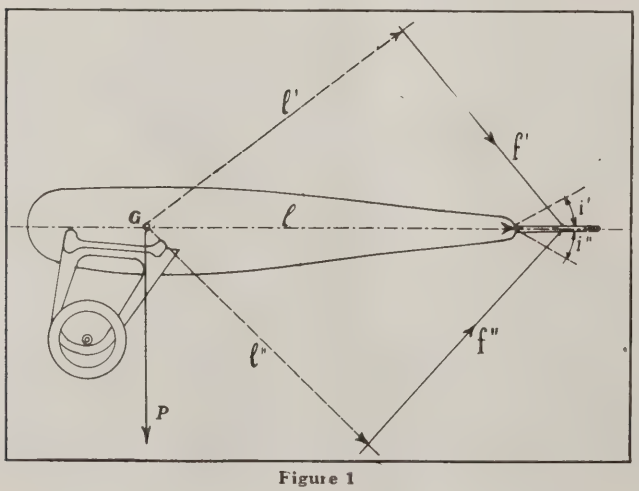


Figure 1

therefore $K' = K'' = K$ and for a positive (down) or negative (up) movement of the rudder, remembering that approximately

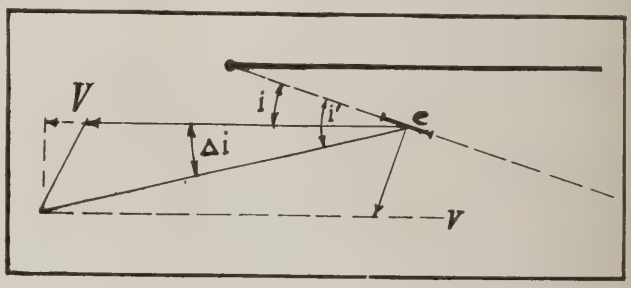


Figure 2

$$l' = l\cos.i' \qquad l'' = l\cos.i''$$

we have

$$M = K s_1 V^2 l\cos.i$$
$$= AK \cos.i$$

where A is constant if V is constant.

For $i = O°$, $K = O$
$\therefore M = O$

For $i = 90°$, $\cos i = O$
$\therefore M = O$

Therefore there is a maximum value of M between $O°$ and 90°. This maximum value of M in practice is given by a value i_o lying between 15° and 25°. For this reason care must be taken that the rudder be turned at an angle not greater than i_o. The action of the rudder would be less effective, while the tendency to slow up the machine would greatly increase.

Therefore for values of i from $O°$ up to $i = + i_o$ the efficacy of the elevator increases with the angle of incidence. As the value of M depends on the square of velocity V, it is obvious that with a small decrease in V the effectiveness of the rudder is greatly diminished. The rapidity with which the movement of the rudder is made has a great influence on its efficacy, because then the velocity of rotation is combined with the velocity V.

Let us consider an element e of the elevator (Fig. 2). Let v be linear velocity of rotation of that element e. The velocity with which it will move through the air is the resultant of V and v, and the actual angle of incidence will not be i, but $i = i + \Delta i$. So that in many cases by brusque manoeuvering, pilots have avoided accidents which would have occurred because (due to excessive loss of velocity), the controls would not give effective response to normal handling.

The question now comes: Should the elevator be installed to the front or rear of the center of gravity? In the Wright biplane this rudder was placed in front. Following designs

showed double rudders, *i. e.*, one forward and one aft. The tendency now is to place the elevator aft.

The "canard" types, which will be discussed briefly later on, are an exception to this rule.

In some modern machines there are no other up-and-down controls besides the elevator, but in most aeroplanes we find a fixed tail or "horizontal stabilizing fin," at the end of which is hinged the elevator proper. The fixed tail is also called the fixed "empennage."

It consists of a surface of small area, and of various shapes in plan: rectangular, trapesoidal, triangular, circular (Fig. 3). In longitudinal section it may be flat, concave, upward or downward.

Whatever be its shape and section, the principle universally followed by designers in regard to the fixed tail is that it must be mounted on the machine so as to form, in conjunction with the wings, the so-called "longitudinal V." This is

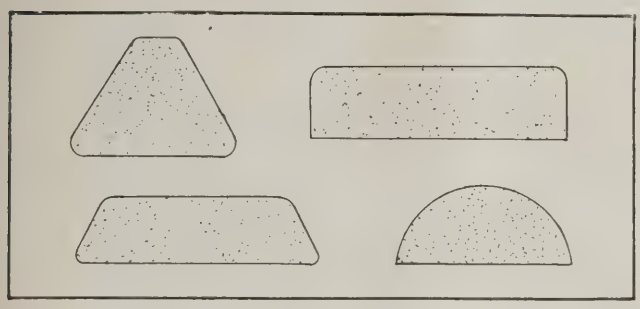


Figure 3

said to take place when the angle of incidence i of the wings is greater than that i_o of the "empennage" (Fig. 4).

Later on, in our discussion on "centrage," *i. e.*, the distribution of the masses and loads in a machine, and in our discussion on stability, we will ascertain the effect of such arrangement. In passing, it is to be noted that some designers, in order to increase the difference $i - i_o$, which is characteristic of the "longitudinal V," make $i_o = o$, or even $i_o < o$.

The principle of the "longitudinal V" may be stated in more

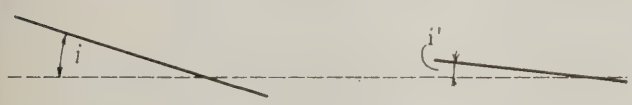


Figure 4

general terms as follows: The fixed empennage must have a unit lift smaller than the unit lift of the wings.

The unit lift is the load lifted per square foot of lifting surface.

Control for Lateral Stability

As explained before, the movements which affect the lateral stability of an aeroplane consist of rotations about the rolling axis of the machine.

Several shapes and arrangements of auxiliary surfaces have been designed and employed for the purpose of automatically insuring lateral equilibrium. However, the results obtained in that field, so far, have proven unsatisfactory, so that in practice the employment of "ailerons" or "gauchissement" is resorted to. The function of the "ailerons" and of the "gauchissement" is to cause, differently or not, an access of air pressure on one of the wings.

"Gauchissement" is that action of the lateral controls which deforms the external part of the wing. This deformation produces an increase or decrease in the angle of incidence. The operation of the gauchissement causes bending moments and torsion stresses to be produced in the longerons and ribs, and subjects the cloth to abnormal tension stresses. These stresses may very well rupture some of the parts mentioned above, especially if the gauchissement has a wide radius of action. The radius of action of the gauchissement may be measured either in degrees or in the vertical distance (expressed in inches) traveled by the extreme rear corner of the wing. A "gauchissement" greater than 15° is harmful. Above these values the effect of the "gauchissement" is diminished, while the effect of slowing up the machine and the abnormal stresses developed in the wing structure are greatly increased.

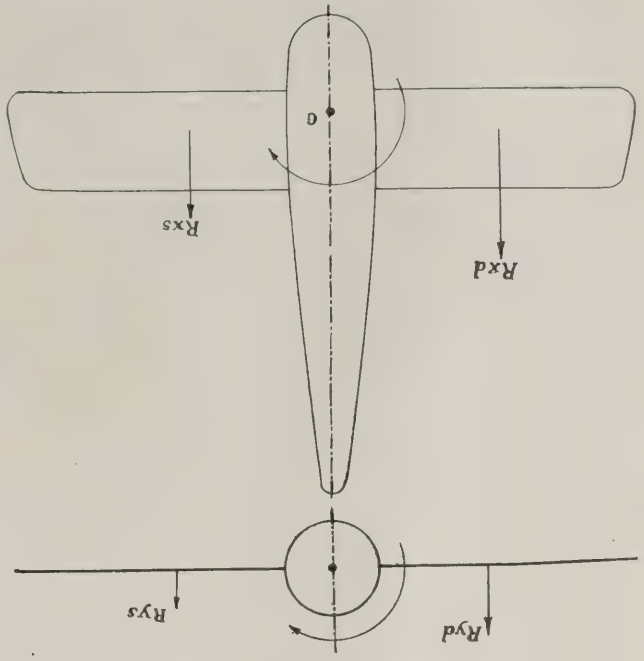


Figure 5

Let R_r and R_L be the air reactions on the right and left wings respectively. In normal rectilinear flight in order for the aeroplane to be in equilibrium we must have

$$R_r = R_L$$

Let us suppose that the aeroplane starts to dip to the right. The pilot will work the lateral control so as to increase the angle of incidence and therefore the lifting effect on the right wing. Then

$$R_r > R_L$$

considering the vertical (R_y) and the horizontal (R_x), components of R_r and R_l, let us call R_{yr} and R_{xr} the components for the right wing and R_{yl} and R_{xl} the components for the left wing. Then

$$R_{yr} > R_{yl} \qquad R_{xr} > R_{xl}$$

and two couples will be developed: the rolling axis will be the axis of one of these couples (R_y) while the axis of direction of flight will be the axis of the other (R_x). The couple R_y will tend to lift the right wing; the couple R_x will tend to turn the machine to the right; in other words, it will tend to decrease the relative velocity of the right wing, and thus to increase that of the left wing (Fig. 5). This horizontal couple may exert such a large moment as to require a counteraction by use of the vertical rudder. In the Wright machine this tendency to turn the aeroplane was so great that it became necessary to combine the lateral and the vertical rudder controls so that they would act both at the same time by moving a single lever. This combination was the essential feature of the Wright patents.

The ailerons are surfaces of small area hinged at the rear of the extreme ends of the wings (Fig. 6). They may be made to take any angle of incidence desired, and thus develop the necessary couples required to produce rotation about the rolling axis.

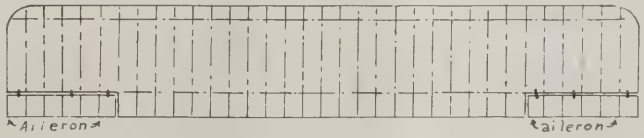


Figure 6

In general, the ailerons are planes, and then, when in normal position, they conform with the rest of the wing (Fig. 7). Since the ailerons also produce the horizontal couples affecting the direction of flight, some designers have adopted ailerons that can be made to assume a negative angle of incidence. This arrangement gives the horizontal couple the tendency

(*Continued on page* 947)

A SUPERCHARGE AIR-SCAVENGED AVIATION ENGINE*

By RAY H. COWLES

THIS description is related to a rotary, multi-cylinder four-cycle gas engine. The objects of the present engine are to construct a four-cycle internal combustion engine of the rotary type, which is so designed that the advantage of the rotary engine are retained and at the same time eliminate the disadvantages of this type as far as possible. Among the improvements claimed of the engine are:

A supercharge of gas to each cylinder.
Auxiliary cooling
Auxiliary exhausting.
Oil weight economy by reduced cylinder wall area per H. P.
Air scavenging.
Efficient ignition and gasoline economy by charge purity.
Balance.
Better torque.
Extreme light weight per H. P.,

and other features which will hereinafter be more fully described, having reference to the accompanying drawings, in which

Fig. 1 is a diagrammatic end view of the engine.

Fig. 3 is a detailed view of various parts as assembled.

Fig. 4 is similar to Fig. 3, taken at right angles.

Referring to the drawings in detail, A indicates a stationary crankshaft, 2 the webs of the shaft, and 3 the crankpin. Mounted to rotate about the crankpin is a hub member 4, which in this instance serves as a multi-cylinder head, a valve casing, a bearing for the cylinders in general indicated at 5, 6, and 7, respectively, a mixing chamber for the incoming gas, and a housing for the cam sleeve, together with the gear mechanism whereby it is operated.

Interiorly of the hub member is an internal gear 8, and secured on the stationary crankpin 3 is a spur gear 9. Turnably in ball bearings 10, supported within the hub, is a sleeve 11, and journaled upon projecting arms 12 carried by said sleeve is a pair of intermediate gears 13 which intermesh both with the internal gear 8 and the spur gear 9. The hub member proper is also mounted on ball bearings as shown at 14, and this, together with the cylinders, is adapted to revolve about the stationary crankpin 3 when the engine is operating. The internal gear will turn in unison with the hub and cylinders and will thereby impart a planetary movement to the intermediate gears 13, causing the same to turn one revolution about their axes when making a complete revolution about the stationary gear 9. The gear ratio is one to three; that is, the diameter of the internal gear is three times the diameter of the spur gear 9, and also the intermediate gears 13. The internal gear together with the hub and cylinders carried thereby, will therefore make one and one-third revolutions while the intermediate gears travel once about the stationary gear. The sleeve 11 carrying the intermediate gears will likewise make one revolution, and as a pair of cam members 15 and 15*a* are secured upon the sleeve, it becomes possible to open and close the inlet valve shown at 16 and the exhaust valve indicated at 17, to each cylinder, once during each two revolutions of the hub members and the cylinders.

The inlet valves as here shown are positioned into the inner end or head of each cylinder and are guided at their upper ends in a bearing formed integral with the valve seat 18, being operated by the levers 19 which carry the rollers 20. A spring "B" interposed between the valve seat and a collar on the lower end of the stem normally holds each inlet valve on its seat, and the roller secured on the end of each lever 19 when engaged by one of the cams 15 or 15*a* serves to lift the valve from its seat when a co-operating piston assumes the proper position.

The exhaust valves are arranged on the forward side of each cylinder as close to the inner end as possible. They are also carried by a valve seat 21 and the stems are carried in a bearing formed centrally thereof. Each exhaust valve is held in its seat by a spring 22 and is lifted away from its seat by a rocker-arm 23 which is operated by a push-rod 24 guided in a bearing 25 carried by the hub member. Each push-rod is provided with a roller at its inner end which is engaged by one of the cams 15 or 15*a* at the proper time, thereby forcing each rod in an outward direction to operate the rocker-arms and lift the connected exhaust valves from their seats.

Mounted in each cylinder is a piston 26 which is provided with a cross-head pin 27, and turnably mounted on each cross-head pin is a connecting-rod 28, the outer end of which is pivotally connected to a pin 29 which is formed integral with the outer ends of the adjacent spokes 32. The discs 30 of the propeller wheel serve to rigidly brace the spokes 32 and these are in turn secured to the hubs 33 journaled on bearings 59 carried by the main crankshaft "A." The propeller wheel proper is concentrically positioned with relation to the crankshaft "A," while the cylinders and connected hub 4 are eccentrically positioned. This construction permits each individual piston member to be connected at the terminals of a plurality of spokes as indicated at 35, and furthermore, permits each individual cylinder to be connected with the discs by means of the link connections 37. The links 37 serve the function of master connecting-rods, that is, they permit freedom of movement between cylindere and the propeller wheels, but will at the same time maintain a fixed speed relation between same during each revolution. This arrangement avoids the perplexing problem of unequal piston strokes as experienced in other types of rotary engines, the advantage of which will like compensate for the presence of the links. The eccentric position of the cylinders with relation to the propeller wheel is such that the pistons will assume their respective positions during each revolution, and are maintained in balance by the arrangement of the two-throw stationary crankshaft in connection with the two sets of cylinders comprising three units to each set.

The present illustration of the engine shows a puppet valve movement which permits a four-cycle principle of operation. This can be understood when it is taken into consideration that the sleeve carrying the cams 15 and 15*a* revolves but one revolution while the cylinders revolve one and one-third revolutions. The two cams will therefore open and close each exhaust and inlet valve once during each two revolutions of each cylinder, thereby allowing the four-cycle function to take place within each cylinder. This can be more clearly understood when it is noted that the retarded movement of the cam sleeve or the greater speed of the cylinders is such that the rollers operating the valves will overtake the cams at the proper points and over-ride same.

Secured on the outer end of each cylinder is a head member 52, in the center portion of which is secured a semi-circular sliding plate 53 through which the piston rods 28 pass. Slidably mounted on each piston rod is a socket collar 54 which is pivotally mounted in the sliding plate, and formed in each cylinder proper are ports 55. Each piston on its inward movement over-runs the ports 55, which allow air to enter the outer cylinder. The major portion of the air is trapped during the outward stroke of the piston, as its lower edge will close said ports and cause compression of the air between the head 52 and the piston's interior. The compressed air is admitted to the working cylinder through a valve 57 carried in the head of the piston. This valve is normally held against its seat by centrifugal action, but it is also mechanically held against the seat by a cam member 58 carried by the inner end of the connecting rod. The angular positions assumed by the connecting rods during each revolution of the engine permit the valves in the piston heads to open only at the proper time after a full charge of gas has been drawn into the working cylinder by the regular means of suction through the mechanical operated inlet valves and also at the end of the power stroke after the cylinder pressures have been effectively released by the above-mentioned ports 55, which in this case are over-run by both ends of the piston. The cam member 58 also serves to positively close the valve 57 when the air pressure of the outer cylinder has become equalized with the gas pressure of the working cylinder during the early part of the compression stroke.

The current employed for the operation of the

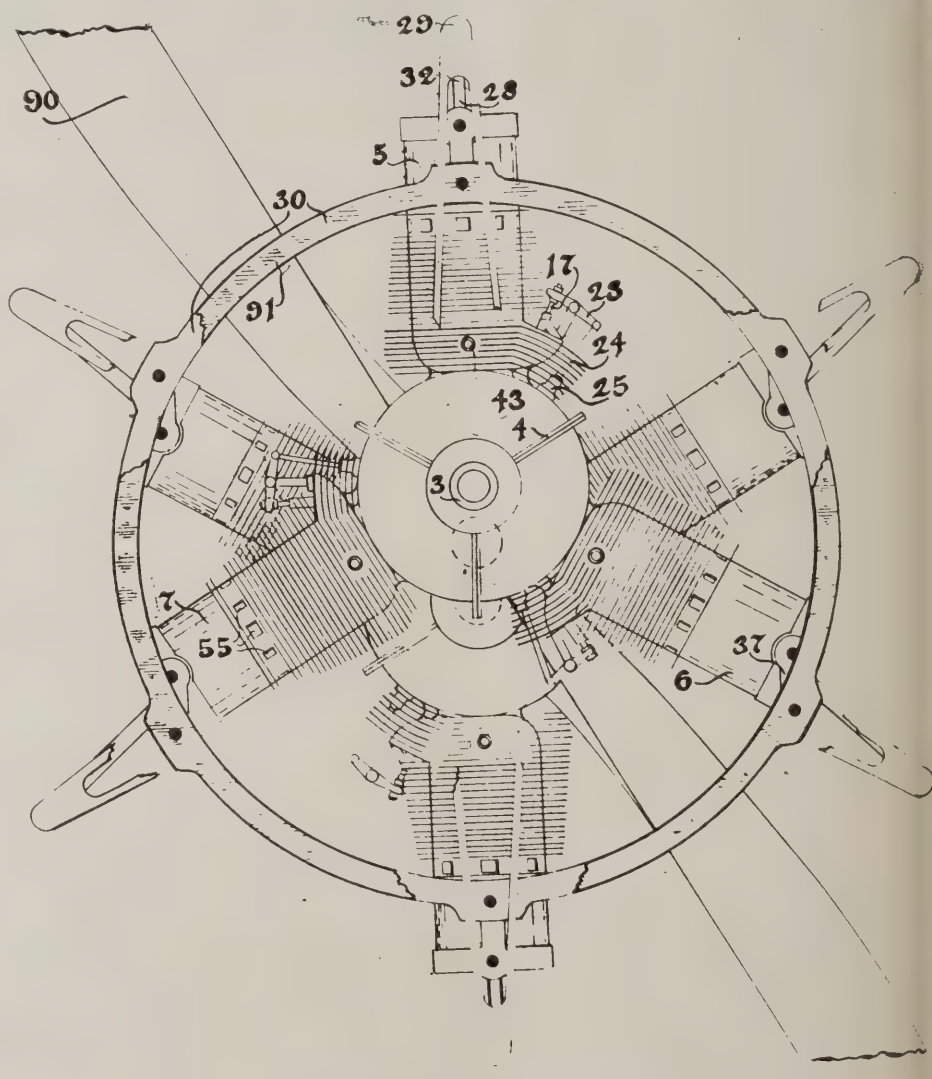


Fig. 1.—Diagrammatic end view of the engine

*Passed by Committee on Public Information.

spark plugs 43 is supplied by high tension magnetos which may be supported on the stationary crankshaft "A." The means of driving the magnetos together with the other simple arrangements are not indicated in the present drawings.

A suitable oil pump is interposed between the source of supply and bearing indicated at 59; from this point the lubricant is carried to the outer pin 29 by means of a duct 60 drilled throughout the length of a connecting spoke; the oil is here forced through a passage 61 drilled through the length of the connecting rod and is distributed over the cylinder and piston walls by the passage formed within the hollow piston pin. This arrangement allows cool lubricant to be delivered directly to the points of requirement; retaining its viscosity and at the same time prevents same from entering the combustion chamber.

By referring to the diagrammatic plan view of the engine, shown in Fig. 1, it will be seen that the crankshaft is provided with two offsets, and that two sets of cylinders each comprising a group of three is provided;; this is of considerable imporance as i allows a cenrifugal balance of the connecting-rods, pistons, etc., permits the use of the even number of six cylinders in connection with a rotary engine of the four-cycle type, and allows a generous circulation of cooling air about each cylinder.

The provision of two groups of three cylinders spaced apart and positioned with relation to each other as here shown also permits the propeller blades 90 to be secured between the same. The blade stresses are partly equalized by being supported and driven from a point in proximity to the center of stresses, as shown at 91, in effect allowing a reduction in propeller weight, an increase in thrust efficiency by a reduction of blade vibration, and a higher rate of propeller speed with safety. Furthermore, the blades are maintained at 180 degrees of separation at all times and are rigidly braced by the spokes 32.

Supercharge

Air is compressed beneath each piston once during each revolution and is admitted to the working cylinder at the beginning of the inward travel of each piston once during each revolution. Therefore, in the case of the four-cycle engine here described, there will be an admission of air at the beginning of each intervening compression stroke. The air admitted during the cleaning stroke serves to reduce the internal temperature, to scavenge the hot burned gases and neutrals from the combustion chamber, and to increase the gas volume by itself being trapped within the combustion chamber; while the air admitted at the beginning of the compression stroke greatly increases the volume and corrects the rich mixture of the primary suction charge. Unlike the scavenging charge, it will be noted that the mixture correcting charge of air enters the working cylinder at a time when all cylinder-head valves are closed, so for this reason, together with the shape and position of the entering air, a thorough mixing with the over-dense gas will result.

The comparatively cool temperature of the combustion chamber gases will effect a more efficient suction charge, so in estimating the actual gas charge, both the combustion chamber volume and the mixture correcting volume must be added to an efficient suction volume. The combustion chamber is comparatively large to accommodate this supercharge, so this feature must be taken into consideration in determining the amount of air which will be entrapped at completion of the cleaning stroke and may also be regarded as favorable to an efficient transfer of air at the beginning of the compression stroke. It will also be apparent to those skilled in the art that further efficiency is gained by reason of the enlarged combustion chamber, in effect presenting a lesser wall area in proportion to the volume inclosed.

Volumetric Efficiency

The volumetric efficiency of the suction charge is improved over ordinary conditions for the reason that a rich mixture will not expand as rapidly during admission to a heated cylinder as would a mixture of lesser vapor; the temperature of the gases met in the combustion chamber are lower than non-scavenged chambers; the suction strokes cannot over-lap; the gas is drawn from a large reserve area, in the direction of centrifugal force, through two head valves, and is finally brought up very close to atmospheric pressure by aid of the cylinder perforations.

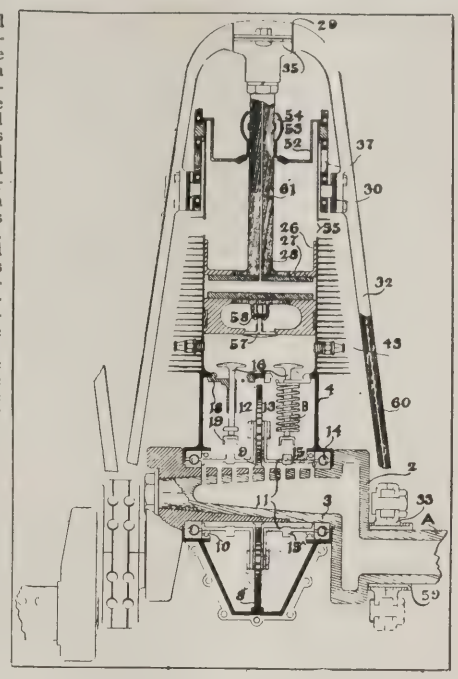


Fig. 4.—Detailed view taken at right angles

Cooling

The cylinders are provided with cooling webs which alone should be sufficient to cool the cylinders; particularly when it is taken into consideration that the heated portion of the cylinder rotates at a lessened circumferential speed, resulting in reduced trailing vacuum and at the same time lie in the path to the air displaced by the hub member. Each exhaust valve discharging to the atmosphere is therefore positioned on the forward side of each cylinder where they are exposed to the greater circulation of air. In the engine here described it will be noted that but three cylinders are placed in alignment, which number allows a liberal circulation of cooling air around each cylinder, particularly when it is apparent that the inner ends of the propeller blades will not only materially assist in the circulation but will destroy the rarefying tendency of the air following in the cylinder wake. The perforations 55 are also used as an auxiliary exhaust, being particularly adapted to the purpose in this engine as an effective means of releasing the increased volume and to divert heat from the main puppet valves. The perforations are also desirable in point of directing any piston ring leakage to the atmosphere and preventing these hot burned gases from re-entering the firing chamber.

This engine operates at a fixed speed and a fixed mixture adjustment by reason of the measured auxilitry air charge; this disposes of the objection to auxiliary exhaust perforations on grounds of disturbing the gas proportions.

The admission and ejection of a large volume of air during each revolution will ventilate and efficiently cool the interior of the pistons and cylinder walls, and will at the same time maintain viscosity of the oil upon the wall surface. This effective cooling of the pistons together with the lowered temperature within the combustion chamber will allow compression pressures and likewise efficiency which would otherwise be impossible without the dangers of pre-ignition.

The scavenging air not only reduces the temperature of the hot gases before expulsion but also hastens and more thoroughly ejects same from the combustion chamber; in effect, diverting heat immediately to the atmosphere which would otherwise be retained during the following cycles of operation, with particular detriment during the suction and compression strokes.

Scavenging

A critical examination of the effects produced by the scavenging air will reveal that the hot burned gases ejected from the firing chamber are replaced by fresh air; this not only allows a slight reduction in cooling web weight by reason of the lowered temperature, but will greatly improve ignition by raising the inflammability of the entire charge. Therefore when it is taken into consideration that the centrifugal feature of the lubrication system prevents excessive oil and oil vapor from being present in the firing chamber, it is evident that unprecedented charge purity will result and that double ignition may not be necessary for rapid burning of the charge. In this manner the explosive quality as well as the quantity of the charge is materially increased.

(*Continued on page* 945)

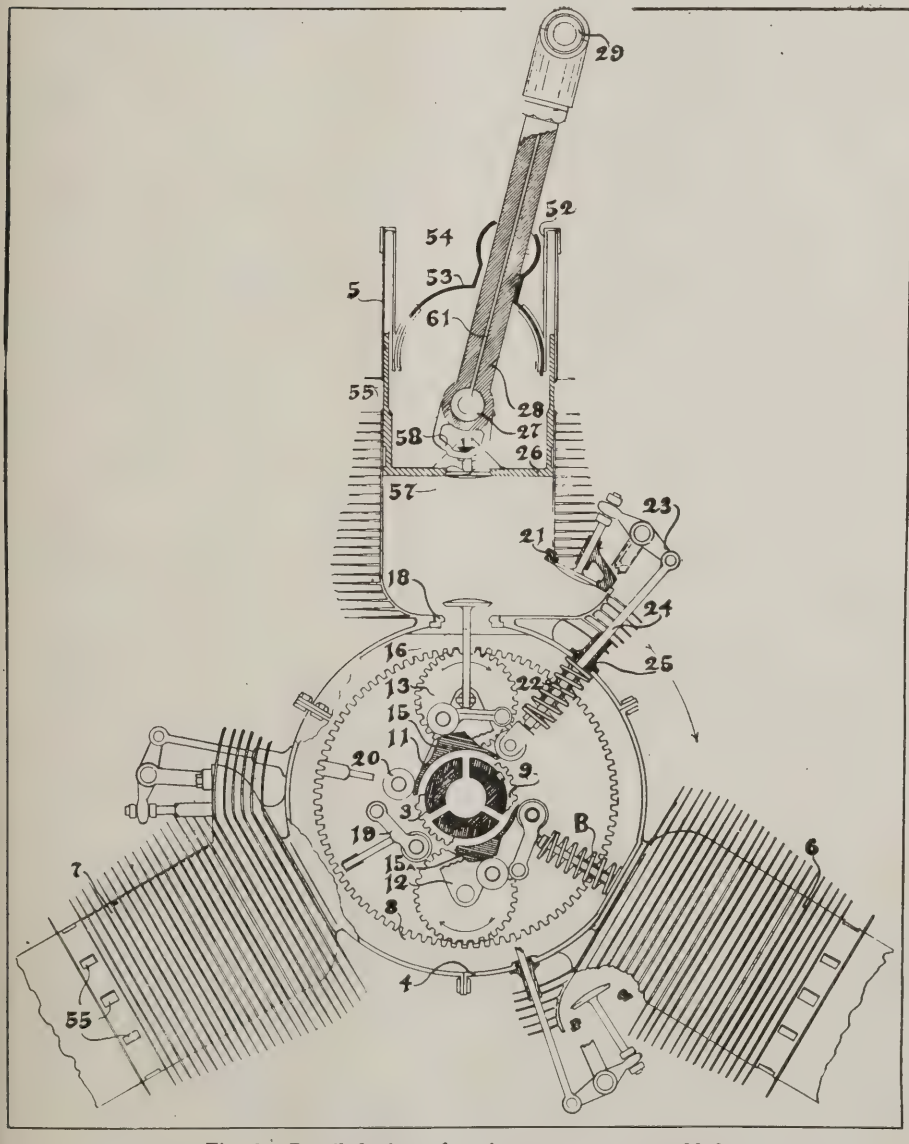


Fig. 3.—Detailed view of various parts as assembled

S. A. E. AERONAUTIC STANDARDS

AT the meeting of the Aeronautic Division of the Standards Committee of the Society of Automotive Engineers January 9th-10th, all of the standards that had been presented for the year were discussed and passed for entry in the society's list of standards.

In our issues of October 15th and November 19th, 1917, we presented standards covering the following subjects: Magneto Dimensions; Varnish Specifications; Dopes; Pontoon Fittings; Engine Weight; Spark Plug Shell; Safety Belts; Wheel Rims; Glue for Propellers; Varnish; Engine Testing Forms; Heat Treatment of Frame Joints; Hand Air Pumps; Inspection Methods; Tension Wire; Machine Gun Mounting; Control Lever Markings; Pipe Fittings and Rubber Tubes; Rubber Hose for Use with Gasoline; Pipe Fittings (Metal); Propeller Shaft Ends and Hubs; Clark Catch; Navy Belts; Ball Hexagon Nuts; Plain Hexagon-Head Bolts; Spark Plug Shells; Spark Plug Tolerance, and Tachometer Drive Specifications.

The following standards have been adopted or revised:

Dopes—Cellulose Nitrate

(1) Dopes for aeroplane fabrics must consist of a clear, uniform mixture of ingredients and be capable of shrinking the fabric to the degree of tautness desired by the customer's inspection. The residual film should be reasonably transparent and free from white spots, and should give a smooth homogeneous surface, when applied in a horizontal position in an atmosphere not exceedng 65 per cent of humidity from 75 deg. F. temperature, free from direct draft.

Viscosity

(2) The viscosity of the dope must permit of direct application without dilution at a temperature not lower than 60 deg. F.

Coating

(3) The dope, when dry, must adhere to the fabric with sufficient tenacity to prevent peeling off in sheets. Test strips should show lint attached to the side which has been in contact with the fabric.

Effect on Tensile Strength and Weight

(4) Four coats or an equivalent of the dope, 48 hours after application, must increase the tensile strength of linen fabrics not less than 25 per cent of the original average strength of warp and filling and of cotton fabrics not less than 15 per cent. The increase in weight per square yard of doped fabric should not be less than 2 ounces nor greater than 2.75 ounces. The test shall be made under standard conditions of humidity and temperature on standard fabrics.

Acidity

(5) No mineral acids shall be present in the dope and the amount of free organic acidity figured as ascetic acid may not exceed 0.05 per cent. No compounds may be present which would be injurious to the fabric.

Cellulose Nitrate

(6) The cellulose nitrate used in the manufacture of dope shall be purified and give a negative potassium iodide test at the end of 20 minutes, according to the standard government method for the Abel stability test. The amount of cellulose nitrate used shall be not less than 55 grams per liter of dope.

Solvents

(7) The volatile solvents employed shall present no danger to the workman applying them.

Exposure Test

(8) Dopes must comply with the following test: A square frame, 12 inches by 12, inside measurement, is covered on both sides with fabric, the fabric being tacked to the outer side of the frame. The fabric is to be tacked under uniform tension, simulating that employed in aeroplane manufacture. Four coats, or an equivalent, of dope are to be applied to each side of the frame, each coat being allowed thoroughly to dry before the succeeding coat is applied. The frames are to be exposed on a roof in an unshaded horizontal position, one side being constantly uppermost. After 60 days of constant exposure no spontaneous cracking of the doped surface should be apparent, and after remaining one hour at a temperature of 70 deg to 80 deg F., the film shall not crack and shall have a decided ring. This test shall be made in duplicate and comparatively with a dope that has previously passed the test, and shall be in effect until a mechanical test is adopted.

*The method of galvanizing, if used, to be specified by the customer.

Shipment

(9) Dope shall be shipped in metal cans, metal or wooden barrels or earthenware containers. Inspection of the containers shall be permitted to insure against the accidental introduction of foreign materials. The container shall be marked with the date of manufacture, serial number, gross tare and net weight.

The varnish specifications have been revised as follows:

The varnish will be flowed on one side of a 10 x 15 cm. (approx. 4 x 6 inch) panel of bright tin. The panels shall be approximately 0.3 to 0.4 mm. (0.0125 to 0.0158 inch) thick, (90 to 100 lbs. weight of base metal per standard box of 112 sheets, 14 x 20 inches, No. 30 to No. 28 U. S. Standard plate gauge), and shall be cleaned thoroughly with benzol. When the panel is held in a vertical position and maintained at a temperature of 21 deg. C. to 32 deg. C. (70 deg. to 90 deg. F.), the varnish shall set to touch at a point not less than 2.5 cm. (1 inch) from the side or top edges of the film, in not more than 5 hours; and shall dry hard in not more than 24 hours to a clear, hard, glossy film. The panel will then be allowed to dry for a further period of not less than five days and then brought to a temperature of not less than 21° C. (70° F.) nor more than 24° C. (75° F.) and maintained at this temperature for not less than 15 minutes. The panel, with the varnished side on the outside, will then be bent double rapidly over a rod 3 mm. (⅛") in diameter. The Varnish film shall show no cracking or flaking at the point of bending.

The varnish will be applied to a basswood panel which has been filled with one coat of drop black in oil thinned with turpentine and drier, and allowed to dry for not less than 10 days before applying the varnish. It shall have suitable body to give proper brushing, flowing and covering properties. The first coat of varnish will be allowed to dry 48 hours, then lightly sandpapered, a second coat applied and allowed to dry 72 hours. The panel will then be inclined at an angle of about 45 deg. and a gentle stream of cold tap water allowed to flow down the middle of the panel for 18 hours. After wiping off with a chamois skin, any deposits due to the tap water, the varnish shall show no whitening, dulling or other defects. A small stream of boiling distilled water will then be allowed to flow down another portion of the panel for 20 minutes. The water will be siphoned through a small glass tube directly from a container in which it is boiling, onto the surface of the panel, in such a manner that there will be no appreciable lowering of the temperature of the water before it touches the varnish film. The siphon delivery tube will be in a plane nearly parallel to the plane of the panel, so that the impact of the water will not tend to break the film. The varnish shall show no appreciable whitening and no more than a very slight dulling, or other indications of marked deterioration, either when observed immediately after removing from the water, or after drying for two hours.

Round High Strength Steel Wire

This specification covers solid high strength steel wire, round section, used in the construction of aircraft when flexibility is of minor importance.

Workmanship and Finish

The wire shall be cylindrical and smooth and may show no evidence of scrapes, splints, cold shuts, rough tinning, or other defects not in accordance with best commercial practice.

Physical Properties and Tests

Tensile Test—Samples for the tensile test shall be not less than 15 inches long and free from bends and kinks. In making tensile tests on aircraft wire, the distance between jaws of testing machine, with the sample in place and before test, shall be 10 inches. The wire must not break at less than the amount specified in the attached table, which is a part of this specification.

Torsion Test

Samples for the torsion test shall be straight, and not less than 10 inches long. The sample shall be gripped by two vises 8 inches apart; one vise shall be turned uniformly at a speed not exceeding 60 revolutions per minute (on the larger sizes of wire this speed shall be reduced sufficiently to avoid undue heating of the wire). One vise shall have free axial movement in either direction. All wire shall be required to withstand the minimum number of complete turns shown in the attached table, and which are calculated from the relation: Number of turns to be agreed upon between purchaser and manufacturer.

Bend Test

Samples for bend test shall be straight and not less than 10 inches long. One end of the sample shall be clamped between jaws having their upper edges rounded with 3/16 (0.188) inch radius. The free end of the wire shall be held loosely between two guides and bent 90 degrees over one jaw; this is to be counted as one bend. On raising to a vertical position the count will be two bends. Wire shall then be bent to the other side, and so forth, alternating to fracture. The minimum number of bends required is stated in the attached table.

Wrapping Test

A wrapping test is to be made on at least 10 per cent of the total number of coils offered for inspection at one time. The wire is wrapped around its own diameter eight consecutive turns with a pitch substantially equal to the diameter of the wire and then unwrapped, maintaining the free end at approximately 90 degrees with the mandrel. It must stand this test without fracture. Because of the possibility of personal error in making this test, failure on one test is not considered conclusive, and if required to do so the inspector shall make at least one, but no more than two, additional tests on the sample of wire. If any of these tests are successful, the material shall be passed as satisfactory in this respect.

Selection of Test Specimen

A tensile, a torsion and a bend test shall be made on each end of each piece or coil of wire. When an individual coil of wire is to be divided into smaller coils to meet special requirements, it is sufficient to make one test on the original coil and to cut and seal the small coils in the presence of the inspector.

Dimensions and Tolerance

All wire for this purpose shall be furnished in decimal sizes corresponding to the American Wire Gage (Brown & Sharpe gage).

A permissible variation of 0.002 inch above gage on all sizes will be accepted, but no wire will be accepted having a variation of more than 0.0005 inch below gage.

Table for Round High Strength Steel Wire

American Wire Gage	Diameter in Inches	Weight in Pounds per 100 Feet	Number of Bends Through 90 Degrees	Breaking Strength, Minimum Pounds	Tensile Strength in Pounds per Square Inch
6	0.162	7.01	5	4,500	219,000
7	.144	5.56	6	3,700	229,000
8	.129	4.40	8	3,000	233,000
9	.114	3.50	9	2,500	244,000
10	.102	2.77	11	2,000	244,000
11	.091	2.20	14	1,620	254,000
12	.081	1.744	17	1,300	522,000
13	.072	1.383	21	1,040	255,000
14	.064	1.097	25	830	258,300
15	.057	.870	29	660	259,000
16	.051	.690	34	540	264,000
17	.045	.547	42	425	267,000
18	.040	.434	52	340	270,000
19	.036	.344	70	280	275,000
20	.032	.273	85	225	280,000
21	.028	.216	105	175	284,000

Non-Flexible 19 Steel Wire Cable

This specification covers high strength 19 steel wire cable used in the construction of aircraft when flexibility is of minor importance.

Manufacture

The steel wires composing the cable shall be laid around the center wire in one or two layers as required by the number of wires in the cable with a left-hand (counter-clockwise) pitch and with a length of lay not to exceed 11 times the diameter of the cable or not less than 9 times the diameter of the cable.

Wires composing the cable shall be uniformly coated with pure tin or galvanized* to solder readily.

Joints in wires composing the cable shall be brazed in a gas fire. Tucked in, welded or twisted joints will not be permitted. No two brazed joints in individual wires shall be closer to one another in the completed cable than 150 feet. All brazed joints in wires shall be tinned. Exposed brass at joints shall not constitute cause for rejection.

Workmanship and Finish

Each length of cable is to be evenly laid and free from kinks, loose wires or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests

Tensile Test—A tensile test shall be made upon each reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be not less than 24 inches in length. In making tensile tests the distance between jaws of testing machine, with sample in place and before test, shall be not less than 10 inches.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing, but in case of failure or dispute on individual tests, and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test

One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and streightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test

A torsion test is to be made on one wire from each sample of cable taken for tensile test. The wire is to be gripped by two vises 8 inches apart. One vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{22}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specifications the cable shall be accepted in this respect.

Dimensions and Tolerance .. ..

There shall be no permissible variation in gage below size. Cable having a diameter of 0.031 (1/32) to 0.156 (5/32) inch, inclusive, shall have a permissible variation of 10 per cent above size and cable having a diameter of 0.187 (3/16) to 0.375 (3/8) inch, inclusive, shall have a permissible variation of 7 per cent above size.

Table of Weights, Sizes and Strength of Cable

ENGLISH UNITS

Diameter, Inches	Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Feet
0.312 (5/16)	12,500	20.65
.250 (1/4)	8,000	13.50
.218 (7/32)	6,100	10.00
.187 (3/16)	4,600	7.70
.156 (5/32)	3,200	5.50
.125 (1/8)	2,100	3.50
.109 (7/64)	1,600	2.60
.094 (3/32)	1,100	1.75
.078 (5/64)	780	1.21
.062 (1/16)	500	.78
*.031 (1/32)	185	.30

*7 wire.

Flexible 6 x 7 Steel Wire Cable

This specification covers high strength 6 x 7 flexible steel wire cable used in the construction of aircraft where flexibility is important.

Manufacture

The steel wires composing the individual strands of the cable shall be laid concentrically around the center wire in one layer of six wires with a left-hand (counter clockwise) pitch or lay. The cable itself shall be constructed by twisting six of these strands composed of seven wires each around a cotton center with a right-hand (clockwise) pitch or lay of 6 to 8 times the diameter of the whole.

Wires composing the cable shall be uniformly coated with pure tin to solder readily.

Joints in wires in cable having a diameter of 0.156 (5/32) inch and larger shall be brazed in a gas fire. In cable having a diameter of 0.125 (1/8) inch or less, wires may be joined either by brazing or twisting, at the manufacturer's convenience. Tucked-in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable than 30 feet. All brazed joints shall be tinned. Exposed brass at joints shall not constitute cause for rejection.

Workmanship and Finish

Each length of cable is to be evenly laid, and free from kinks. loose wires or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests

Tensile Test—A tensile test shall be made upon each individual reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be no less than 24 inches in length. In making tests the distance between jaws of testing machine with sample in place and before test shall be not less than 10 inches.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing; but in case of failure or dispute on individual tests and at the request of the manufacturer check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test

One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test

A torsion test is to be made on one wire from each sample of cable for tensile test. The wire is to be gripped by two vises 8 inches apart. One vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specifications the cable shall be accepted in this respect.

Dimensions and Tolerances

There shall be no permissible variation in gage below size. Cable having a diameter of 1/16 to 3/32 inch, inclusive, shall have a permissible variation of 12 per cent above size; cable having a diameter of 1/8 to 3/16 inch, inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 7/32 to 3/8 inch, inclusive, shall have a permissible variation of 7 per cent above size.

Table of Weights, Sizes and Strength of Cable

Diameter, Inches	Minimum Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Feet
0.312 (5/16)	7,900	15.00
.250 (1/4)	5,000	9.50
.218 (7/32)	4,000	7.43
.187 (3/16)	2,750	5.30
.156 (5/32)	2,200	4.20
.125 (1/8)	1,150	2.20
.109 (7/64)	830	1.50
.094 (3/32)	780	1.30
.078 (5/64)	480	.83
.062 (1/16)	400	.73

Flexible 7 x 7 Steel Wire Cable

This specification covers high strength 7 x 7 flexible steel wire cable used in the construction of aircraft where flexibility is important.

Manufacture

The steel wires composing the individual strands of the cable shall be laid concentrically around the center weir in one layer of six wires with a left-hand (counter-clockwise) pitch or lay. The cable itself shall be constructed by twisting six of these strands composed of seven wires each aronud a seventh strand of the same construction and material with a right-hand (clockwise) pitch and with a length of lay of six to eight times the diameter of the whole.

Wires composing the cable shall be uniformly coated with pure tin to solder readily.

Joints in wires in cable having a diameter of 0.156 (5/36) inch and larger shall be brazed in a gas fire. In cable having a diameter of 0.125 (1/8) inch or less, wires may be joined either by brazing or twisting, at the manufacturer's convenience. Tucked-in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable than 30 feet. All brazed joints shall be tinned. Exposed brass joints shall not constitute cause for rejection.

Workmanship and Finish

Each length of cable is to be evenly laid, and free from kinks, loose wires, or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests

Tensile Test—A tensile test shall be made upon each individual reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be no less than 24 inches in length. In making tests the distance between jaws of testing machine with sample in place and before test shall be not less than 10 inches.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing; but in case of failure or dispute on individual tests and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test

One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test

A torsion test is to be made on one wire from each sample of cable for tensile test. The wire is to be gripped by two vises 8 inches apart. One vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specifications the cable shall be accepted in this respect.

Dimensions and Tolerances

There shall be no permissible variation in gage below size. Cable having a diameter of 1/16 to 3/32 inch, inclusive, shall have a permissible variation of 12 per cent above size; cable having a diameter of 1/8 to 3/16 inch, inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 7/32 to 3/8 inch, inclusive, shall have a permissible variation of 7 per cent above size.

Table of Weights, Sizes and Strength of Cable

Diameter, Inches	Minimum Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Feet
0.312 (5/16)	9,200	16.70
.250 (1/4)	5,800	10.50
.218 (7/32)	4,600	8.30
.187 (3/16)	3,200	5.80
.156 (5/32)	2,600	4.67
.125 (1/8)	1,350	2.45
.094 (3/32)	920	1.45
.078 (5/64)	550	.93
.062 (1/16)	480	.81

Extra Flexible 7 x 19 Steel Wire Cable

This specification covers high strength 7 x 19 extra flexible steel wire used in the construction of aircraft where extra flexibility is important.

Manufacture

The steel wires composing the individual strands of cable shall be laid concentrically

around the center wire in one layer of 6 wires and another, or outer layer, of 12 wires with a left-hand (counter clockwise) pitch, the lay or pitch of both layers being of the same length; the cable itself shall be constructed by twisting 6 of these strands composed of 19 wires each around a seventh strand of the same construction and material with a right-hand (clockwise) pitch or lay of 6 to 8 times the diameter of the whole.

It is to be understood that the strand composing this cable must not necessarily be composed of wires all of the same diameter.

Wires composing the cable shall be uniformly coated with pure tin to solder readily.

Joints in wires in cable having a diameter of 0.187 (3/16) inch and larger shall be brazed in a gas fire. In cable having a diameter of 0.156 (5/32) inch or less, wires may be joined either by brazing or twisting at the manufacturer's convenience. Tucked in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable than 30 feet.

Workmanship and Finish

Each length of cable is to be evenly laid and free from kinks, loose wires, or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests

Tensile Test—A tensile test shall be made upon each individual reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be no less than 24 inches in length. In making tensile tests the distance between jaws of testing machine with sample in place and before test shall be no less than 10 inches.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing, but in case of failure or dispute on individual tests, and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test

One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test

A torsion test is to be made on one wire from each sample of cable taken for tensile test. The wire is to be gripped by two vises 8 inches apart; one vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specification the cable shall be accepted in this respect.

Dimensions and Tolerances

There shall be no permissible variation in diameter below size. Cable having a diameter of 0.125 (⅛) to 0.187 (3/16) inch, inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 0.218 (7/32) to 0.375 (⅜) inch, inclusive, shall have a permissible variation of 7 per cent above size.

Table of Weights, Sizes and Strength of Cable

Diameter, Inches	Minimum Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Feet
0.375 (⅜)	14,400	26.45
.344 (11/32)	12,500	22.53
.312 (5/16)	9,800	17.71
.281 (9/32)	8,000	14.56
.250 (¼)	7,000	12.00
.218 (7/32)	5,600	9.50
.187 (3/16)	4,200	6.47
.156 (5/32)	2,800	4.44
.125 (⅛)	2,000	2.88



Elmer B. Taylor, of Cedar Grove, N. J., is a member of the French Foreign Legion

Reels for Cables

S. A. E. Recommended Aeronautic Practice

Diameter of Cable	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
	1,000 feet				3,000 feet				5,000 feet				10,000 feet			
1/32	12	4	8	1⅛	12	4	8	1⅛	12	4	8	1⅛	16	4	10	1⅛
1/16	12	4	8	1⅛	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛
5/64	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛
3/32	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛
7/64	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛	18	10	8	1⅛
1/8	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛
9/64	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛	24	16	10	2⅛
5/32	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛	24	16	10	2⅛
3/16	18	7	12	2⅛	18	10	8	2⅛	24	10	10	2⅛	24	16	10	2⅛
7/32	18	7	12	2⅛	18	10	8	2⅛	24	10	10	2⅛	32	20	16	3⅛
1/4	18	10	10	2⅛	24	10	10	2⅛	32	18	16	2⅛	36	22	18	3⅛
5/16	18	10	10	2⅛	24	10	10	2⅛	32	18	16	2⅛	36	22	18	3⅛
11/32	18	10	8	2⅛	32	16	16	2⅛	32	20	16	3⅛	50	16	26	3⅛
3/8	18	10	8	2⅛	32	16	16	2⅛	32	20	16	3⅛	50	16	26	3⅛

Dimensions given in inches.

Round solid high strength steel wire is to be shipped in coils or bundles protected with waterproof wrapping of paper.

In making racks for the above reels allow 4 inches greater width than the traverse specified above.

The following changes have been adopted in Rubber Hose Specifications:

Chemical Properties of Rubber

The rubber contents shall not be less than 25 per cent by weight of Plantation or Wild Nevea rubber.

The amount of free sulphur in the tubs, cover, or friction compound shall not exceed 1 per cent.

Clamps and Fittings for Rubber Hose

S. A. E. Recommended Aeronautic Practice

In order to comply with present practice and utilize existing hose connections, the list of sizes shown on S. A. E. data sheet 37, Vol. 1, was recommended for aeronautic practice.

Clamps and Fittings for Rubber Hose

S. A. E. Standard Sizes

Inside Hose Diameter	Outside Diameter of Hose and Extended Inside Diameter of Clamps				Length of Fitting for Lap of Hose
	Single-ply	Two-ply	Three-ply	Four-ply	
3/16	7/16	½	9/16	5/8	1
¼	½	9/16	5/8	11/16	1
5/16	9/16	5/8	11/16	¾	1
⅜	5/8	11/16	¾	13/16	1
½	¾	13/16	⅞	15/16	1
¾	1	1 1/16	1⅛	1 3/16	1
1	1¼	1 5/16	1⅜	1 7/16	1¼
1¼	1½	1 9/16	1⅝	1 11/16	1¼
1½	1¾	1 13/16	1⅞	1 15/16	1¼
1¾	2	2 1/16	2⅛	2 3/16	1¼
2	2¼	2 5/16	2⅜	2 7/16	1¼
2¼	2½	2 9/16	2⅝	2 11/16	1¼
2½	2¾	2 13/16	2⅞	2 15/16	1½
3	3¼	3 5/16	3⅜	3 7/16	1½

Limits on inside diameter of hose ± 1/64. Limits on thickness of hose (not measured at lap) ± 1/64. All dimensions in inches.

Aeroplane Engine Testing

The following test specifications are divided into two classes, one a Routine Factory Test and the other a Type Test.

ROUTINE FACTORY TESTS FOR FIXED ENGINES

(Low or Normal Compression)

Test No. 1

Engines may be run in by such methods as are found most satisfactory for each type of engine, but must not be run under own power over ten hours before the first official test.

Test No. 2

For engines with compression ratio 5 and below.

Engine will be mounted on a torque stand or stationary stand and fitted with club or propeller, properly calibrated for rated load at rated speed. Engine will be fitted with all the accessories that are to be supplied by the engine manufacturer. If started by hand, it must in every attempt be started within five minutes by one man.

Test will consist of: Four hours continuous running at rated power and rated speed. All readings required shall be recorded on S. A. E. standard log sheet every ten minutes.

(a) The test must be continuous and in case of a stop occurring during the first hour, the run will be repeated.

(b) In case of a stop occurring after the first hour and not due to a fault of the engine, the run will be continued, but the inspector may require an extension of the running time equal to twice the time lost.

When a stop occurs at any time due to a fault of the engine, the inspector may require the complete run to be repeated.

(c) No manipulation of the engine, while running, will be allowed, except such as can be made by a pilot from his seat. Replenishing of gasoline and oil supplies and regulating of the cooling water temperature is allowable.

Engine will be dis-assembled, inspected and if all parts are accepted, it will be re-assembled. If in the opinion of the inspector, parts must be replaced, he may require the whole or portion of the run to be repeated.

Test No. 3

Engine with all the accessories that are to be supplied by the manufacturer will be mounted on a torque stand and fitted with a club or propeller, properly calibrated. It will be given a continuous run of one hour at not less than rated power and rated speed. All readings required will be recorded on S. A. E. standard log sheet every ten minutes.

After this test the engine shall be cleaned and inspected and put into condition for shipment. If satisfactory, the engine shall be stamped by the inspector.

Note—If desired, the horsepower may be corrected for air temperature and barometic pressure. In such cases the power will be corrected to a surrounding air temperature of 59 deg. F. (15 deg. C.) and normal sea level pressure which is 29.92 (760 mm.) of mercury at 32 deg. F. (0 deg. C.) and at 45 deg. latitude.

In case of question the corrected power shall govern.

(High Compression)

Test No. 2A

For engines with compression ratio exceeding 5:

Engine will be prepared as under Tests No. 1 and No. 2.

This test will consist of four hours continuous running at 8/10 rated load and rated speed. Otherwise, this test will be the same as No. 2 and the same rules will apply.

Dis-assembly and inspection will be the same as in Tests No. 2 and No. 3.

Test No. 3A

This test will be the same as No. 3 but at 8/10 rated load and at rated speed.

After this test, the engine will be inspected and accepted as in Routine Test No. 3.

AVIATION SPARK PLUGS

By O. C. ROHDE, M. E.

Chief Engineer, Champion Spark Plug Company

WE have for some years given time to the study of spark plugs for automobiles and for all sorts of automotive engines. When we take up the question of aeroplane spark plugs in particular, the first thing we want to know is why there is need of making a separate study of spark plugs for aeroplanes. There are two very good reasons why this should be done.

In the usually rapid development of aircraft engines, engineers have had to advance at a rate much faster than would have been the case in normal times. Analysis of the methods of modern warfare have proven conclusively that the surest way to win is by the use of aircraft in great numbers. The beginning of war found the aircraft industry in its infancy. It has been necessary to crowd the development of years into as short a space of time as possible and as a result we have advanced in engine design to a point far beyond normal.

That the aircraft engine is different in many ways from the ordinary automobile engine, we will all admit. The point which concerns us most in this article is the fact that we have had to secure extreme power at reasonable engine speeds and at a minimum weight per horsepower. That, in turn, means increased compression. Increased compression means higher temperatures, and higher temperatures require better spark plugs.

If a spark plug goes wrong in an aircraft engine, it is a far more serious proposition than a like case on solid ground. Consequently we must have a plug as nearly proof against misfiring as possible.

When we consider that the spark plug industry has been in existence for quite a number of years, we may wonder at the fact that plugs have not been developed to a point approaching nearer perfection than they are at the present time. We have many good plugs, but we cannot say at this time that we are absolutely sure that each one of a given set of plugs will give a certain specific performance in an engine. We must still allow for a chance of imperfections. The honest fact of the matter is that the automobile industry has not insisted on perfect plugs, and further that trade and price conditions have been such as to discourage rather than encourage the manufacture of too good a plug. Europe from the first, was supplied with excellent natural material for the manufacture of good plugs. It was a comparatively simple matter to develop plugs that were good. In this country, long and laborious engineering research was necessary to develop insulators from the materials at our command. Years ago we could import foreign material easily and were not pushed to develop our own insulators from our own resources of raw material. For that reason engineering research has been applied for a few years only, and it has been seriously handicapped by the fact that there is little natural raw material in the country which lends itself readily to the making of spark plugs.

We are just at the beginning of an era of development which will teach us the whys and wherefores of the action of ignition currents and their relation to the spark plug problem. We too must crowd the development, which should have been under way for years, into a short space of time so that as a result we may give our men in the air, spark plug insurance and with it, assurance. If we can do so, we shall at the same time be able to give to the automobile industry, spark plugs which are practically trouble proof.

Granting that the war conditions and air craft requirements in particular, have driven us to a more rapid development of spark plugs than heretofore, we will now make a brief analysis of the spark plug and its elements. The best way is to divide it into its major elements and consider the problems and difficulties of each.

There are three essential elements in a spark plug. First, the insulator; second, the electrodes; and third, the general design and construction.

Insulators are of two kinds: mica and ceramic. First we will give a short statement on mica insulators. All mica cores are made up of thin sheets of mica, either in the form of laminated washers, or in the form of sheets wound around a central spindle. It is impossible to gauge the tension of winding mica exactly. A few drops of oil on a sheet of mica will change it from an insulator to a conductor. On this account, if the core is not perfectly wound, and if there is any space, however small, between the layers of mica, the plug will short circuit in a very short time on account of the accumulation of oil between the layers. To date there is no definite method of inspection to determine whether a mica plug is safe to use or not. The only way of finding out the possible life of a mica plug is to actually run it in the engine.

Ceramic insulators are a baked clay product; usually some form of porcelain. Spark plug porcelains must have four properties to be of value. They must be mechanically strong; they must be able to stand sudden heat changes without cracking; they must have high electric resistance when hot, and they must have a surface which will resist fouling. Porcelain is inherently mechanically weak. One of the greatest problems before us in the development of aircraft spark plugs, is to increase the mechanical strength of spark plug porcelains. Of course a large percentage of porcelain breakage is due to careless handling of wrenches, but the breakage in actual service is still too high for comfort. A satisfactory method of tying the porcelain together from top to bottom has recently been developed which holds the spark gap rigid and permits of running even after a plug is broken. However, all these devices are but makeshifts and it is imperative that rapid developments be made in the mechanical strength of porcelain. In making these developments, however, it is essential that none of the other necessary properties be ignored.

Porcelain in spark plugs must stand terrific heat shocks. Some engines when started cold, show a jump in average temperature in the combustion chamber, from room temperature to nine hundred degrees F. The porcelain must be able to stand this, not only once, but repeatedly.

The average porcelain is a poor heat conductor. There is much talk these days about having the porcelain conduct heat rapidly, etc. However, to date, every ceramic body which has proven a good heat conductor has also proven to be a good electric conductor, and if a porcelain does not insulate, it is worthless in a spark plug. Perhaps the most important point to be mentioned about spark plug porcelain is, that it must retain its insulation resistance at high temperatures. Ceramic bodies, without question, have a fixed cutout temperature. That is, there is a certain temperature at which they become conductors. All porcelains will allow some current to pass through, even at comparatively low temperatures, but the essential point is that they do not allow all the current to pass through them instead of jumping the gap at the highest temperature reached in the hottest combustion chamber. Average combustion chamber temperatures above fourteen hundred degrees F. have been measured. Many of our standard spark plug porcelains which show a cut-out temperature much below this, have gotten by nicely on land engines.

In aircraft engines we need a factor of safety, so the porcelain which can show the best factor of safety in this respect, is worth a thorough trial. There are many problems involved in this di-electric property of porcelain insulators. The development of these problems is one that is now being pushed as rapidly as possible. Much credit is due to the Bureau of Standards for the invaluable aid they have given the industry in the solving of the early stages of this problem.

As stated, a porcelain when hot may allow the current to pass through it instead of jumping the gap. A deposit of oil sticking to a porcelain may also conduct the current away from the gap and give a condition called "surface short," *i. e.*, the current passes over the surface of the porcelain through the conducting part of the oil coating. Spark plug porcelains must have an oil-shedding, smooth coating; must be so mixed and baked that oil cannot penetrate them, for once the oil has penetrated, the spark will follow. So much for porcelains.

Our present-day product is good. It is improving in leaps and bounds, but it has not yet a sufficient safety factor. Our development work must supply one if we would give safety in the air.

The second important factor in spark plugs is the electrode wire. It must be a good heat conductor; it must be a good electric conductor; it must be absolutely non-corrosive; and it must not expand sufficiently to split a porcelain which has a low coefficient of expansion. The ideal electrode would have the same coefficient of expansion as porcelain. There is no such metal. Nickel manganese has proven the best metal for electrodes. It must be checked carefully for impurities as even small percentages of impurities will corrode and spoil its usefulness in service.

The third important feature of spark plugs is design and construction. A spark plug is a small article but there are many details to consider in its design. Too heavy an electrode wire may cause premature ignition. Too light a wire may warp in heat and change the gap. More than one ground electrode is sure to cause pre-ignition in hot high compression engines. Too little or too much clearance between porcelain and shell may cause trouble.

The spark plug according to Government specifications

(*Continued on page* 947)

FOREIGN NEWS

AUSTRIA

Alarmed by losses sustained during the last fortnight, it is reported that the Austrians have invoked German aid, especially as reprisals for the air raids against Padua, are feared. Recent losses have been exceptionally heavy, forty-two of their aeroplanes having been destroyed in the past two weeks.

FRANCE

The French announcement of January 20th reports the following aerial activity:

"On Saturday our aerial crews were engaged in a number of combats. Six German aeroplanes were destroyed. Two others seriously damaged fell within their own lines."

As a result of the activity of French airmen, the French official report of January 21st informs us that on January 20th three German aeroplanes were brought down and, in addition, four enemy machines fell inside their own lines after engagements with French pilots.

A German bombing aeroplane, returning from Dunkirk, was forced to make a landing near Bulscamp. Four passengers, one of them an officer, were made prisoners.

A summary of three days' aerial activity, contained in the official report of January 23d, announces the destruction of ten German machines, as follows:

"In the period of January 17th to 20th ten German aeroplanes were brought down. In addition, it is confirmed that four German machines, reported as having been seriously damaged in a preceding period, were in reality brought down, thus increasing to nineteen the number of machines destroyed by our pilots from January 1st to 10th."

A party of American army officers recently travelled from France to London, and the Germans pursued them from the beginning to the end of the trip. They were shelled when they left the front, bombed on the port of departure, bombed on the trip, narrowly escaped a submarine on the Channel, and arrived in London just after an air raid warning had been issued.

Contrasting with the comparative lull in aerial activity, the French official report issued on January 26th details very extended and vigorous activity on the west front, as follows:

"During the day of January 25th French aviators showed particular activity, numerous photographic undertakings being carried out by the French observers, who surveyed the German zone as far as thirty kilometres (nearly nineteen miles) into the interior. More than 300 photographs were taken during the day.

"Pursuit aviators brought down four German machines. Our bomb-dropping machines carried out various operations during the day as well as in the night following. Eight thousand kilograms of explosives were dropped on German establishments, notably the railway station at Thionville and Fribourg, in Breisgau; the Ridische (Raschig) aniline works at Ludwigshafen, and cantonments in the region of Longuyon."

The night report of January 26th announces that three German aeroplanes were downed by anti-aircraft defenses.

GERMANY

According to the offical announcement of January 21st, during the last two days (January 19th and 20th), eleven enemy aeroplanes and one captive balloon were brought down.

A summary of the last four days' activity in the air issued on January 26th reports bombing and combat activity as follows:

"In the last four days twenty-five enemy aeroplanes have been downed in aerial encounters by our gunfire. Our aviators successfully attacked the north coast of France, including Dunkirk, Calais and Boulogne. Good effects were observed.

"Within a few minutes yesterday Lieutenant Roeth brought down three French captive balloons in flames."

GREAT BRITAIN

Successful bombing activity and victorious combats are reported on January 20th, as follows:

"There was much successful air bombing of the enemy's troops and dumps yesterday. Eight hostile machines were brought down. Four of ours are missing."

On the night of January 21st the British conducted a successful bombing raid, which is described in the official announcement of January 22d as follows:

"Monday night our flying machines dropped over 200 bombs on Courtrai and the enemy's billets at Roulers and Rumbeke. Raids also were carried out into Germany. Two tons of bombs were dropped on the steel works at Thionville, on large railway sidings at Bernstorf, thirty miles south of Metz, and on the Arnaville railway junction."

In the French official report on the Balkan front, issued January 22d, it is announced that British aviators bombed enemy batteries and establishments in the neighborhood of Seres and a train on the railroad between Seres and Drama.

The following dispatch from London has been received by the Reuter's Limited Agency of Canada:

"A wonderful story is told of the adventure of a young airman, who, in thick weather, landed and asked a peasant his whereabouts. At that moment he beheld a troop of German cavalry galloping toward him. He immediately opened his engine full, and, skimming the ground, charged the advancing Germans.

"The leading officer fired an automatic pistol, the airman opening with his Lewis gun. The enemy's casualties include the officer and numerous men and horses, and the remainder bolted. The airman escaped."

Mr. Winston Churchill, in speaking of British war aims at Bedford, said: "We must raise the strength of our army to its highest point and we must have clouds of aeroplanes."

Under the direction of Lord Rothermere, an Air Inventions Committee, which was nominated by Lord Cowdray previous to his resignation, has opened headquarters in London. The main function of the committee will be to investigate inventions submitted to it. It will develop and put into operation as soon as possible any invention which promises to add to the efficiency of aircraft.

Sir William Weir, Controller of Aeronautical Supplies has been appointed Director-General of Aircraft Production, by the Ministry of Munitions.

On the night of January 24th British aviators in the neighborhood of Seres, on the Balkan front, bombed Bulgarian encampments and brought down an enemy machine.

At the present time the two heroes of the air in England are Captain James McCudden, twenty-two years old, and Captain Philip Foullard, nineteen. The exploits of these aviators have but recently become known. Captain McCudden has brought down thirty-four German machines; Captain Foullard has accounted for forty-two. The squadron of which Captain McCudden is the leader has brought down ninety-nine enemy aircraft. Captain McCudden has never lost an encounter. In a recent letter, just published, he says that he brought down four German airmen in one day—two before lunch and two after. The next day his score was three.

BELGIUM

The Belgian communication of January 19th reports that a battery of anti-aircraft guns brought down a German aeroplane north of Ryppe.

ITALY

Improved weather conditions resulted in greatly increased aerial activity, as compared with the preceding days. The Italian official announcement issued January 26th reports the following operations:

"Improved atmospheric conditions resulted in great aerial activity on both sides. Our machines successfully bombarded the enemy's encampments and railway works at Cismon and Primolano, and effectively dropped bombs on military objectives between the the Sile and the Piave. Our own and our Allies' squadrons made reconnoitering cruises and several times attacked numbers of hostile machines. Two were shot down by our airmen and two others by British aviators, who also set fire to hostile captive balloons."

RUSSIA

In a mysterious fire and explosion at Gutuyevsky Basin in Petrograd 1,100 aeroplane machine guns and a large quantity of ammunition was destroyed, and twenty persons lost their lives.



Engine failure accounts for this German motor's presence in Trafalgar Square



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island

BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn

INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana

BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.

NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Natural Gliding Forms

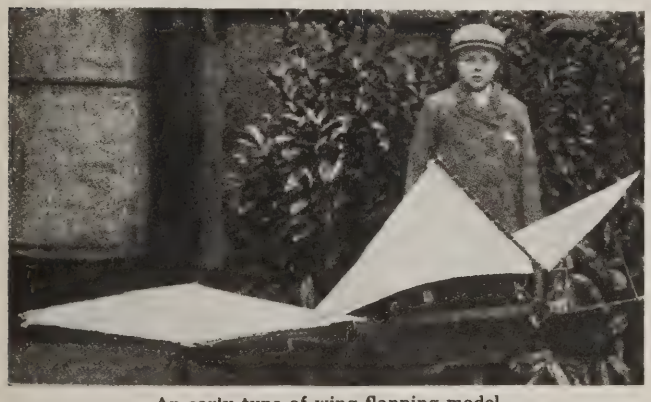
The Rev. A. J. Bartlett sends the following notes, supplementary to those which appeared in our issue of the 25th June:—

"In pursuance of my theory of the desirability of a true monoplane possessing 'all-round' stability independently of a tail plane, I noted in nature's best gliders, *e.g.*, the gull, butterfly, and bat, certain features common to them all. To mention three: (1) The wing plan is roughly concave at the anterior and convex at the posterior margin; (2) the tail plane is small and normally neutral, or is non-existent; (3) the wing planes are uneven, *i.e.*., of varying section from root to tip.

"Adopting the last feature I obtained tail-less gliders of all three plans, bird, butterfly, and bat.

"Further, of three types of wing-plan, viz., straight, crescent, and indented (omitting their distinctive behavior and the effects of varied aspect in elevation), the indented type appeared most consistently to maintain its direction of flight continuously either in a straight or circular course.

"Of this type I experimented with three patterns outlined in my sketch (Fig. 1), and of these pattern B gave on the whole the best all-round results.



An early type of wing flapping model

"Pattern C requires inner half of wing positive, outer half negative and lowered, leading edge of tip ultra-negative.

"From observed effects a vertical fin or rudder is very undesirable, horizontal steering being best effected by minute variation of the negative wing-ends, not by the tail, whose function lies mainly in the vertical plane.

"The most valuable features in the form of glider described are (1) its quick recovery from a dive (dropped head-down from the hand it regains an even keel before reaching the ground); (2) its quick recovery from side-slip (dropped sideways from an increased height it *slews round to the head-down position*, whence it regains an even keel as before; (3) theoretically, its power of recovery from stalling (dropped tail down it would lift on the raised and expanded tail plane, straighten out, plunge, and recover as before).

"May I, in conclusion, briefly illustrate a theory of *speed-variation* from my observation of a gull (Fig. 2) driving at immense speed against a gale of wind, and viewed from behind. The outer half of the wing, which is normally slightly negative or less positive than the inner half, has become very markedly negative, showing the under surface.

"Though, perhaps, impossible in an aeroplane to reduce wing area like the gull, such increased negative warp, or its equivalent, is possible, and would reduce lift, counteract the forward travel of supporting centre, and increase stability."

A Propeller for Tractor Models

"I am sending you some notes" writes Mr. Harold T. Holman, "of a form of propeller which I think is admirably suited for tractor models. It is modelled upon exactly the same lines as the remarkable 'Aile dotative Cyrnos,' which was used with so much success by Signor Nardini on the Deperdussin monoplane on which he crossed the Channel. He very kindly gave me a model of his 'rotating wing,' as it is termed, and I thought you would be interested to have some particulars of it.

"The shape is somewhat singular, the blade tapering from about 1.75 ins. at the boss to ⅞ in. at the tip. It is also tapered (viewed edge-on) so as to ensure a constant pitch along the whole length of the blade. In section the blades like the section of a monoplane wing reversed, *i.e.*, the digging edge tail, instead of leading this shape, seems to give so far as I can see, a stronger pull than an ordinary flat or slightly hollowed-out blade, whose section is the arc of a circle.

"There are points about this propeller which tend to make 'tractor-planing' easier, for:—

"1. The shape renders it easy to construct.

"2. It has far less tendency to snap off at the boss.

"These, I think, will greatly help the novice who is taking up 'tractor-planing' as a hobby and who is not very proficient in propeller and tractor-construction."

NIEUPORT FLYING PAPER MODEL

By Theodore Hodgson

First construct the fuselage, which needs no explanation. Next cut out the wing. Attach a piece of stiff, but flexible wire to the leading edge of the wing by means of the flaps, (A). This strengthens the wings and preserves the dihedral. The rudder (C) and the tail-plane (B), are next pasted on to the fuselage.

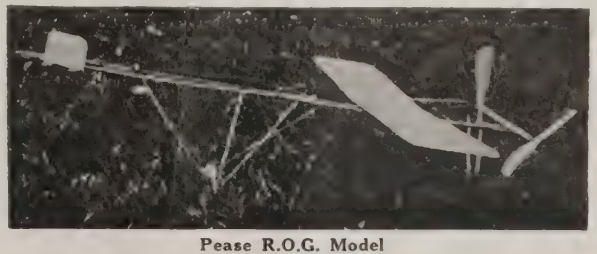
The landing-gear is next to be considered, and this should be made by pasting the shaded part of the shapes (D) onto the insides of the fuselage, and add a brace at the wheel hubs.

The model is now ready for the power plant. First secure a stick 9½ inches long and 3/16 of an inch square, for the motor stick. Attach a small hook to the end (rear). Next make the propeller-hanger out of a piece of sheet-iron about 2½ inches long, and ⅜ of an inch wide. Attach to the motor-stick by binding and aying. Next make the shaft out of a piece of hay-wire. Nearly every model builder is familiar with the method of securing the propeller to the propeller-shaft (G). Use several glass beads between the propeller and hanger to prevent friction.

The 4-inch carved propeller is driven by 6 strands of 1/16 square rubber.

Before gliding under power, test the model for its stability and distance. It should glide at least 15 feet. Adjust the elevators and wings until it does so.

Anyone should be able to make adjustments where they are needed. Under favorable conditions the model will fly 30 feet and sometimes farther.



Pease R.O.G. Model



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Ill Wind

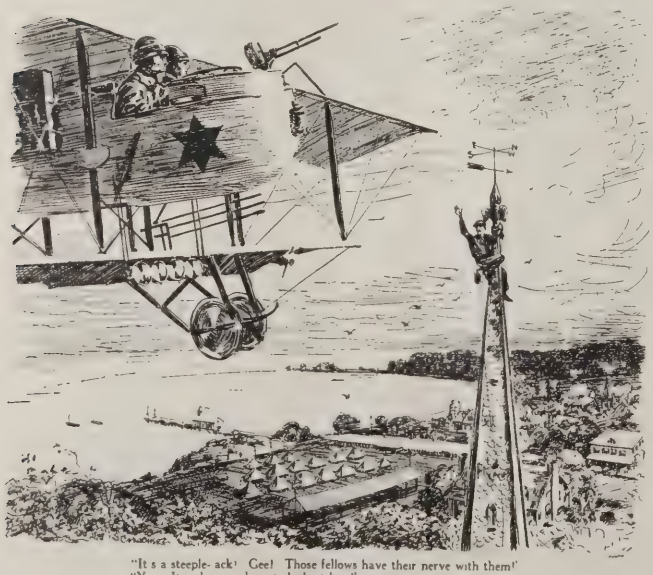
A serious case of military damage of the greatest importance by the Hun raiders disclosed on Saturday last should help to hearten the instigators of this type of "civilized" warfare and encourage them to continue their city bombing practices. The case is that of Alice Price, 60 years of age, and an inmate of the Philanthropic Home for Women, Southwark, who being worried by air raids and having lost all her money except a penny, spent that penny on poison. The Huns, however, will be saddened to learn that fortunately the poison was not effective, and the Marylebone magistrate last week, before whom the old lady was bathed in tears, was able to put her in safety for a time by committing her for trial for attempted suicide. —*Flight.*

Mail by aeroplane, it is said, will soon be a "reality." That's good. Some of the other kinds are becoming almost imaginary.

General Hell is a prominent officer of the German Army. Wonderful how one can inspire an entire nation.—*Pittsburg Post.*

THE ADJUTANT (to prospective orderly room clerk)—Well, you say you're good at figures. Now, if there were four flies on this table and I killed one, how many would there be left?
THE CANDIDATE—One, sir. The dead one.

"I see the American troops in France are going to use ready-made trenches."
"Who made 'em?"
"The Germans." —*Navy Air Pilot.*



"It's a steeple-ack? Gee! Those fellows have their nerve with them!"
"Yes. It makes me dizzy to look at him!"

The Aviator's Alphabet

A is the airman who looped the Hunguffin*
For his own pleasure. (He is now in his coffin.)
B is the batman who dirties the quarter,
Ruins our boots, and forgets our hot water.
C is the Castor the rotaries use,
It bucks up both engines and humans-excuse.
D is for drift, if you land with it on,
You will, almost at once, realize you were wrong.
E is the engine which causes the motion
Which gives you the life (not caused by promotion).
F is the fairy you love with a pash,
She is sure to be there on the day that you crash.
G is the gas which makes things go roun'
And some time does not, in which case you come down.
H is the hangar one greets with such smiles,
On return from a run of some ninety-odd miles.
I is the incidence out on each plane,
From which you get lift, I need hardly explain.
J is the Joy-stick—I mean control lever—
Which the Hun† always clings to, as if in a fever.
K is keel surface, it stops you from spinning,
Perhaps, if you know when the spin is beginning.
L is the loop you're intending to do
If the wind will go down and the sky get quite blue.
M is the man who keeps crashing on landing,
Why he won't flatten out passes all understanding.
N's the nacelle of a fast pusher scout
Twixt you and the earth, if you crash, there is nought.
O is hot oil, when it gets in your eyes
You will surely wear goggles at last and be wise.
P is the prop which makes sticks which are sold,
It has other uses as well, I am told.
Q is for Quirk, a machine of stability,
Of peculiar design, but unbounded utility.‡
R is R. A. F. who've designed a machine,
And an engine as well, such as never was seen.
S is for stunting, if done near the ground
It is stupid and silly and grossly unsound.
T is the tarmat I stand on all day,
And hope for a chair in an optimist's way.
U is the union of pipe and of tank,
When the union gave way the aeroplane sank.
V is the Vicker's gun, gruesome affair,
Used to wind up the Hun in the air.
W is wash-out and wash-in as well,
Their meaning's a secret I hardly dare tell.
X is the pilot, whose glory and fame
We'll remember in England, tho we don't know his name.
Y is the yell of a man (or its echo)
When his engine's gone dud on a long-distance recco.
Z is the letter of letters, my friends,
It involves the worn Zeppelin (this is the end).

The Aeroplane.

---

*Hunguffin—the R. A. F. BE2b.
†A term of endearment applied to all pupils in aviation.
‡Quirk—the R. A. F. BE2c.



A remarkable photo of a Canadian aviator flying against clouds, taken from another airplane at a Canadian Aviation Camp.

Courtesy International Film Service

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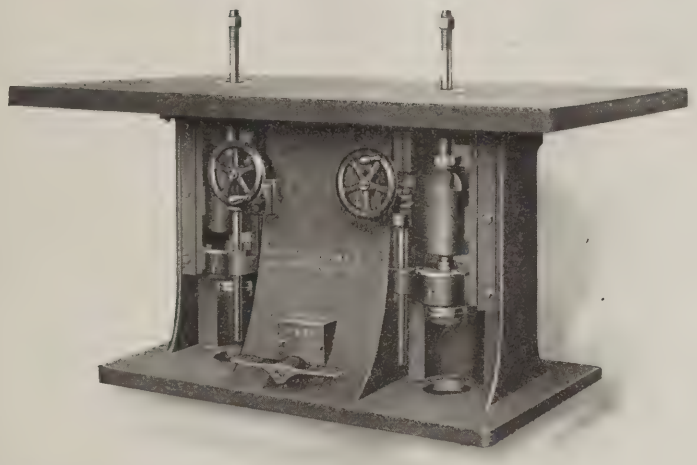
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A Supercharge Aviation Engine

(*Continued from page 935*)

Weight

Much has been said concerning the lubrication problems of the ordinary type of rotary engine, with particular reference to the abnormal consumption of oil and the consequent burden of lubricant supply for extended flight.

Since the internal frictional cylinder wall area determines the normal consumption of oil, and the centrifugal action is the cause of abnormal usage, it follows that a reduction of wall area with relation to H. P. will effect a like reduction in normal oil consumption; and a reversal of the relative direction of centrifugal action will cause a reversal of the effects. In the engine here described, oil is drained away from the combustion chamber by centrifugal force, instead of into it; and the supercharge allows of a considerable reduction in the frictional wall area per H. P., therefore these two important economics, together with the cessation of waste lubricant, will enable an extended flight radius which is not possible at present with other types of engines.

The combustion chambers of suction charge engines are so proportioned as to obtain the highest possible compression without pre-ignition, so if the compression pressures now in common use are as high as may be permitted, it is necessary that the supercharge engine here described shall be provided with enlarged combustion chambers and that the maximum compression pressure per square inch will be approximately the same as in the regular suction charge engine. The maximum pressure per square inch after ignition will likewise be approximately the same as the suction engine if the scavenging effects are disregarded. Therefore, by proper design, the supercharge will manifest an increase in power by a longer duration of ordinary working pressures, rather than an increase in the maximum pressure per square inch. Since cylinder diameter and piston head diameters are not increased in proportion to the combustion chamber volume, increase in cross-section and weight of the cylinders, pistons, connecting-rods, etc., may not be necessary; in fact, will allow of a general proportionate weight reduction throughout the engine.

Accidental breakage of a connecting-rod will not of necessity stop the engine nor do serious damage to the adjacent parts. This contributes a valuable safety feature and at the same time permits a lower factor of weight and strength of these ports.

The engine here described in general may be constructed as a three, five, six, or ten cylinder; using a double throw crankshaft as indicated in the drawings, for the six and ten cylinder types; and a single throw crankshaft in connection with the three and five cylinder types. Slight changes in the cam and gear mechanism being necessary in connection with the five-cylinder assemblies.

If the present engine were operated as an ordinary suction charge rotary engine, it would be reasonable to expect that the weight per effective H. P. would not exceed the low average of rotary engines, so when it is taken into consideration that the gains of the supercharge scavenging air, etc., will materially reduce these low figures, and that the flight radius is increased, it would appear that important steps may be taken toward an efficient aviation engine.

Annual Report of Standards Bureau

(*Continued from page 928*)

engines under conditions of reduced atmospheric pressure, in order to determine, among other things, the effect of different grades of fuel with respect to the variations of atmospheric air pressure encountered under conditions of actual flying. It may be that for high altitude service considerable improvement in power, climbing ability, and speed can be obtained by the use of special fuels. The same laboratory will serve for testing out other methods and appliances, such as carburetion accessories, which have been proposed for increasing the power output at high altitudes. All of this work is of the utmost military significance.

Liberty Engine

Since the middle of June the design work on the Liberty engine, which is to be produced on a large scale for use on American-made aeroplanes, has been temporarily quartered at the Bureau of Standards. All divisions of the Bureau have co-operated to the fullest extent in supplying technical information of every character and, where necessary, have conducted investigations to aid in the production of this motor.

Investigation of the Effect of Kiln-Drying Spruce

The scarcity of good air-dried spruce for the purpose of aeroplane manufacture has led to an investigation of the effect of kiln drying on spruce timber. This investigation is being carried on in co-operation with several furniture manufacturers who have the necessary facilities for kiln drying the lumber. It is hoped that this investigation will result in a suitable method for kiln drying spruce which will give a material as satisfactory for use in aeroplane construction as the present kiln-dried spruce. This work has been outlined and is now in progress. The results, when obtained, will be communicated to the Aircraft Board of the Government for their immediate use.

Aeroplane Strut Investigation

A tentative outline of the investigation of aeroplane struts was submitted to the various aeroplane manufacturers for criticism and suggestions before this work was begun. The suggestions made are incorporated into the final program in so far as this was possible.

Work is now under way on an investigation to determine a suitable column formula for use in design of aeroplane struts. This investigation is being conducted upon air-dried spruce and comprises lengths of L/R from 25 to 250. It is the intention to determine from this investigation an empirical formula to be used as a guide in the design of aeroplane struts, no formula at present being available for this work.

Resistance of Wood to Alternating Stress

Investigation on the resistance of various kinds of wood to alternating stress was undertaken some time ago. A few preliminary experiments were conducted on a machine now in the possession of the Bureau, but this machine was found to be wholly unsatisfactory for the work. The results obtained, however, were indicative of the necessity of such an investigation and a machine was designed and has been built in the shops of the Bureau. The investigation is now under way. A sufficient number of tests have not yet been made to warrant the drawing of any conclusions. A battery of these machines is now being built so that the results may become immediately available for use at the present time. These results will be communicated to the proper board, when available, for their guidance in the selection of material for aircraft production.

Porcelain for Spark Plugs

The insistent demand for spark plugs capable of standing up under severe use in aeroplanes, tractors, etc., has been the incentive for conducting experiments aiming to produce bodies capable of giving maximum service. For this purpose the compositions of the French and German special spark plugs have been reproduced and are now being tested for dielectric strength in the laboratories of the Bureau. Additional hard-fire porcelain compositions are likewise being tried out for this purpose.

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Aeroplane Construction in General

(*Continued from page* 933)

of turning the machine in the direction favorable to the most rapid re-establishment of lateral equilibrium.

However, this disposition of the ailerons decreases the efficiency of the wing because it increases the head resistance and diminishes the lift. To eliminate the latter disadvantage, Schneider has adopted a type of aileron divided into two symmetrical parts, one assuming a negative angle of incidence,

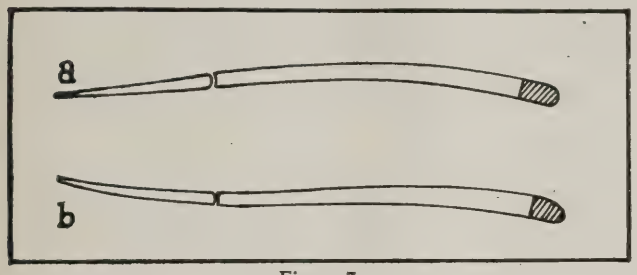


Figure 7

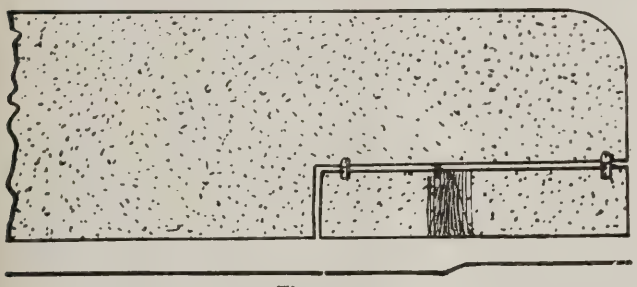


Figure 8

and the other assuming a positive angle of incidence (Fig. 8). In this manner the horizontal component of the air reaction on the aileron is constant and no horizontal couple is developed. This type of lateral control has been adapted to the LVG type of German aeroplanes.

The advantage of the ailerons over the "gauchissement" lies in the fact that the abnormal torsion and flexure stresses are entirely absent. Moreover, by a proper adjustment of the control wires the ailerons can be made to work in combination, thus greatly increasing their effectiveness.

Generally, the "gauchissement" control is used on monoplanes and the aileron control on biplanes.

(*To be continued*)

Aviation Spark Plugs

(*Continued from page* 939)

should be gas tight. Not because as is often said, "A slight leak in the plug will cause compression leakage," but because too much and too continuous a passage of hot gases through the porcelain or between porcelain and shell, will make it a conductor. If we can get the safety factor mentioned above for our porcelain, we can be less particular in regard to a slight leak. Plugs must be so assembled that there is no strain set up in the porcelain that will be augmented by the vibration of an engine. It is important that heat be carried away from the sparking points as rapidly as possible. That means a shell construction with as much radiating surface as possible.

Much is being said these days about the advantage of Metric plugs over the ⅞"-18 S. A. E. standard. In the writer's opinion, there is no such advantage. The real reason for the belief that there is an advantage, is peculiar. As stated before in this article, we have been far behind Europe in the development of spark plug insulators. Some years ago, our best plugs came from Europe. The porcelains were better. Naturally these plugs were made in the metric thread size. Without due consideration, this has led to the conclusion that Metric plugs were the best. Given the best porcelain, we can make just as good a plug in ⅞"-18—perhaps better—for we have more room in which to work.

In conclusion. We are just at the beginning of aircraft spark plug development. There is much to be done. The war is lending impetus to the work of advancement. As a result we shall have in the near future, the perfect plug for all purposes,—at least a plug with a sufficient factor of safety to insure the lives of our boys who are fighting for us in the air in Europe.

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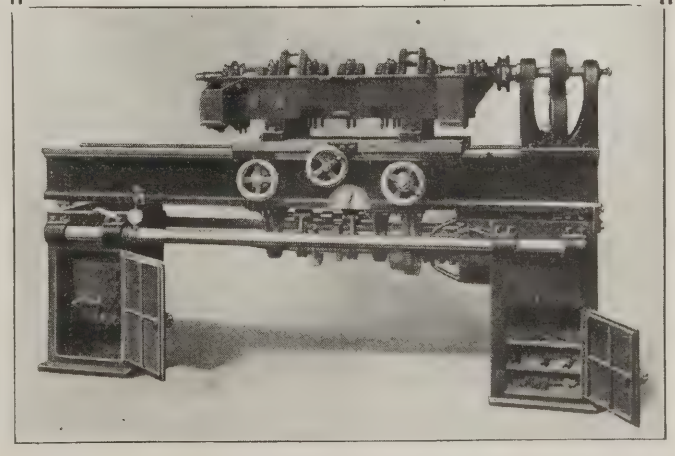
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AERIAL AGE WEEKLY

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Aero Club Banquet Rally for Aerial Preparedness



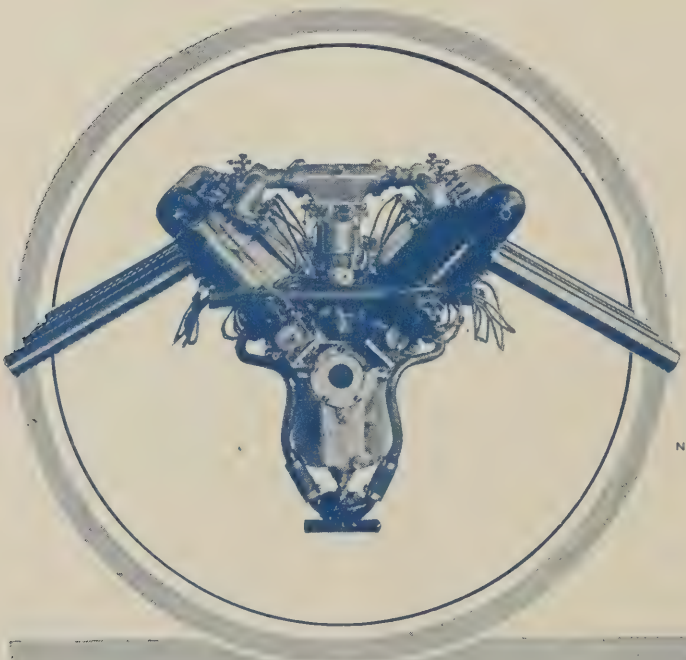
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AERO CLUB BANQUET RALLY FOR AERIAL PREPAREDNESS

EX-CONGRESSMAN MURRAY HULBERT, who was the spokesman of aeronautics in Congress and fathered the movement that led Congress to appropriate $640,000,000 for Army aeronautics, was the guest of honor at the *Twelfth Annual Banquet of the Aero Club of America, held at the Club House 297 Madison Avenue, New York*, on February 4th.

The keynotes of the speeches was haste in the preparation of our aerial program and the vital necessity of speed in providing for the aeronautic equipment which we must furnsh.

Owing to the railroad congestion, the plans for a banquet with over one thousand participants was given up and the dinner confined to the capacity of the Aero Club dining room. More than eighty members of the club were in attendance and Mr. Alan R. Hawley, President of the Aero Club of America, presided. The speakers included, besides the guest of honor, the Hon. Murray Hulbert, who has recently been appointed Dock Commissioner of this city; Rear Admiral Robert E. Peary, U. S. N., retired, President of the Aerial League of America and Chairman of the National Aerial Coast Patrol Commission; Mr. Henry A. Wise Wood, Chairman of the Conference Committee on National Preparedness, and Hon. Francis M. Hugo, Secretary of State of New York State.

Other guests and members of the club present were: Col. Samuel Reber, Signal Officer, Eastern Department, U. S. A., and Major James A. Blair, Jr., Raymond B. Price, W. W. Miller, W. Redmond Cross, Robert J. Collier and Henry Woodhouse, members of the Board of Governors of the club, Captain Robert A. Bartlett, Messrs. R. A. C. Smith, Jefferson Seligman, Edgar B. Davis, John B. Munn, Charles R. Lamb, William D. Gash, Captain R. K. Blair, Harrison Williams, Lieut. Raffe Emerson, U. S. N. A. S., Harrington Emerson, William Hawley, Bernard H. Sandler, Augustus Post, Col. Sidney D. Waldon and G. Douglas Wardrop.

Greetings from President Wilson

Among the foreign officers, guests of the club, were Henri Ferré, the famous French military aviator-painter, and Captain Hugo D'Annunzio, of the Royal Italian Flying Corps.

President Alan R. Hawley, in his address read a telegram from President Woodrow Wilson:

"Please give my warm greetings to the Banquetters this evening and express to them my deep interest in the whole development of aviation upon which we have now embarked. It is a matter to which it is worth while to give the best thought and energy of the country, and I am glad that the Aero Club of America should be enlisted in that support."

(Signed) WOODROW WILSON.

He spoke of the membership of the club as being larger to-day than at any time in its history. He also read letters from Senator Morris Sheppard, who introduced the Sheppard-Hulbert bill in the Senate regretting that he could not attend the banquet of the club, tendered to his co-partner, the Hon. Murray Hulbert, and saying:

"It was my good fortune to labor with him in behalf of aviation. He gave the subject profound and comprehensive study and pointed the way to the most effective use of this wonderful agency. He may justly be called one of the leading pioneers in the development of aeronautics.

"No man of higher patriotism, broader vision or more disinterested devotion to the interests of the people ever sat in the Amercan Congress than Murray Hulbert."

And from Congressman Julius Kahn, from California, who sent the following inspiring message:

"Hearty congratulations and best wishes. The importance of aviation in this war must not be minimzed. Your organization has done yeoman service in bringing this matter to the attention of the American people. Our aviators will doubtless be able to astonish the Teutons with some American tactics in this branch of warfare. Once more I wish success."

Secretary of War Baker sent the following telegram of greetings:

"In the light of the tremendous developments of aeronautics since the first of the dinners, and the limitless possibilities for the future, the gentlemen of your association have every reason to be proud of their record in the past and their chance for usefulness in the years to come."

(Signed) NEWTON D. BAKER,
Secretary.

The Secretary of the Navy, the Honorable Josephus Daniels, has telegraphed as follows:

"It is becoming more and more clear as the war goes on that aviation will play a most important part. It may be a decisive part in the final result. It is equally clear that the United States is coming—by commanding all resources—into a position to contribute to the Allied cause superiority in this branch of warfare. Every facility of our country is being utilized toward mobilizing our aeronautical resources for the battles in the air."

(Signed) JOSEPHUS DANIELS.

Governor Whitman, of New York, sent the following telegram:

"I regret sincerely that a prior engagement of long standing makes it impossible for me to attend the 13th annual banquet of the Aero Club of America, but I am pleased to avail myself of this opportunity as Governor of this State to express to you my great appreciation of the patriotic and consistent efforts of your organization in the cause of aviation. It is due to the work of the Aero Club that hundreds of young men were trained and ready for service in France soon after our entry in the war. There is nothing more stimulating to official activity as the example of organizations like the Aero Club of America. The world's strategists of today are repeating what your officers foresaw several years ago that the war is to be decided in the air. It is, therefore, of vital necessity that every effort be concentrated to gain and maintain aerial supremacy for our Allies."

(Signed) CHAS. E. WHITMAN.

Mr. Elmer A. Sperry telegraphed as follows:

"America's contribution to aircraft warfare is bound to be a substantial, if not a determining factor, in winning the war. The work is well in hand, even ahead of the mark on some schedules. The coming year will be crucial and the Aero Club must aid as never before in constructively co-ordinating the work. Regret inability to attend annual banquet. Many of the club's friends join in wishing you Godspeed."

(Signed) ELMER A. SPERRY.

Announcements of the awarding of the War Service Medal

of the Aero Club of America was made and the work of the Foreign Service Committee and the war relief work in co-operation with the Aeronautic Committee of the National Special Aid Society and the Women's Naval Service.

After dinner had been served Mr. Alan R. Hawley, President of the club, addressed the members and guests as follows:

"On behalf of the Board of Governors I welcome you to the Twelfth Annual Banquet of the Aero Club of America, and perhaps the most important one ever held in the history of the club, on account of the war and on account of the responsibilities which rest upon this nation and the executives of our Government.

"I propose a standing toast to the Commander-in-Chief of our Army and Navy and an honorary member of our club, the Hon. Woodrow Wilson, President of the United States of America.

"At the annual meeting you remember we passed resolutions pledging our support to President Wilson and he has sent to us the following splendid letter:

"'May I not thank you very warmly for the beautifully engrossed resolutions which you have been good enough to send me? I shall be obliged to you if you will express to your associates my genuine appreciation of this assurance of co-operation and support. It is most heartening and encouraging.

"'Cordially and sincerely yours,

(Signed) "'WOODROW WILSON.'

"Following our annual custom, I propose that we drink a silent toast to Wilbur Wright and the men of the air who have given their lives for the cause of aeronautics.

"Orville Wright cannot be here with us, but has sent us the following telegram:

"'Cordial greetings to the members of the Aero Club of America assembled tonight at the twelfth annual dinner. It is very gratifying to me to see the aeroplane program taking so important a place in the contribution of America to the cause of the Allies. The character and ability of those in charge of the program insure its successful completion.

"'ORVILLE WRIGHT.'

"Our last dinner was held March 30, 1917, one week preceding our entrance into war, and an announcement was then made that the club's efforts were largely instrumental in increasing the appropriation for aeronautics from $3,000,000 to $17,000,000, and our campaign of education was continued, with the result that our work materially helped in getting the bill carrying an appropriation of $640,000,000 for aeronautics for which our guest of honor was sponsor.

"The Second Pan-American Aeronautic Exposition, which was to have been held this year, was postponed on account of railroad congestion.

"The club membership is larger today than at any time in its history. Seventy members have been admitted since the Annual Meeting in November, making a total of 1,000 members, about 300 of whom are serving in the Army and Navy Reserve.

"The Curtiss Marine Flying Trophy has been awarded to Caleb Bragg for his flight from New York to Troy and return. Mr. Bragg very generously donated the $1,000 prize to be divided equally between the National Special Aid Society and the Woman's Naval Service.

"The Collier Trophy Committee has thought it advisable under the conditions that exist this year not to award this annual trophy, which is given for the greatest annual achievement in aviation. The presentation of this trophy and of models of merit for the greatest technical achievements of the year would necessarily involve the divulging of technical developments which we must keep secret.

"In place of the Aviation Medal of Merit, the club has had designed and struck, a war service medal, which has been awarded on the recommendation of the Foreign Service Committee, of which Ambassador Sharp, who represents our Government in France, is the Honorary Chairman, to the following American, British and French aviators who have died for the cause of the Allies: L. Norman Barclay, Julian C. Biddle, Courtney Campbell, Oliver M. Chadwich, Victor Chadwick, Victor Chapman, Charles Clinton Genet, Edmund C. Genet, Ronald Hoskier, Douglas McMenigal, James McConnell, Norman Prince, Kiffen Y. Rockwell, and Captain George Guynemer of the French Army and Lieut. Ball of the British Army; also to the following men in active service, Major William Thaw, Major Raoul Lufbery, Lieut. Charles Nungesser, Major Wm. Bishop, British Army; Captain Barraca, Italian Army; Lieut. Thierry of the Belgium Army.

"Our Foreign Service Committee is rendering most valuable service to our aviators who are in France. And in this country we have had the close cooperation of the National Special Aid Society and the Woman's Naval Service in supplying the much-needed flying equipment which American aviators require. In December twenty aviators arrived from San Diego having clothing which was suitable to the warm climate of Southern California, but which was not at all suited to the winter weather of New York. We immediately took this matter up with Mrs. Alice Hunt Bartlett, Chairman of the National Special Aid Society, which provided that with the necessary warm clothing. This is only one of many such cases. At Christmas time, the Woman's Naval Service sent many Christmas boxes and comfort kits to the men in the aviation stations of our air service.

"We have furnished speakers for many entertainments for the benefit of aviators to raise funds to supply their needs, and the boys all feel that the Aero Club of America is their best friend.

"I want to stop a moment to let our minds dwell upon a memory which I know is sacred to us all, and the memory of one whom I know we all remember with love and admiration, one of the Board of Governors of our Club who died in France, where he had gone at the request of the Board to organize the Foreign Service Committee. We all feel that Evert Jansen Wendell died in the service of our country and in the performance of a great and sacred duty."

The Hon. Francis N. Hugo, the Secretary of State of New York, spoke in most complimentary terms of the worth of the Aero Club of America.

Mr. Henry A. Wise Wood, who was characterized very appropriately by Chairman Hawley as "the man who always looks one year ahead in preparedness," spoke as follows:

"When America entered the war, we of the Aero Club of America made up our minds, as you well know, that we should leave no stone unturned to make the aerial participation of America in the war the chief of all its glories.

"To this end, it is good to recall, we were able to draw upon that great fund of confidence which through years of faithful work we had established in the press, and in the minds of the American people, and set before the country a project for the aerial invasion of Germany, which caught its imagination and met with its instant approval.

"Whereas, therefore we had been unable to make more than slight progress in arousing the Army and Navy Departments, or Congress, to take aeronautics seriously, and introduce it properly into the service, immediately America went to war we were able to arouse the country to the value of this new military instrument, and to prevail upon Congress to appropriate nearly a billion of dollars for the establishment of a great military air service.

"We had the good fortune to have the executive of this vast project put into the hands of thoroughly trained men of high executive ability who have carried it forward in much brilliant fashion that we have every reason to believe that the development of the air service will prove in the end to have been perhaps the Government's best war job.

"We are now approaching the beginning of the culmination of these vast air plane, and, but for one thing, we should be looking forward hopefully to their successful execution, not at home sorely, but at the fighting fronts, and over the territory of Germany itself.

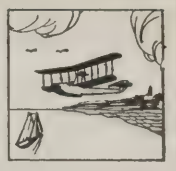
"That one thing of which I speak is of so grave a nature that it begins to assume the bulk of a great international dictator. As it now stands, this one thing will prevent the execution of our air project and the delivery abroad of our fighting flying machines in the necessary great masses in the present year. Not this alone, for it threatens also to minimize all of our military efforts as to constitute a partial paralysis of the arms of the United States and to leave our Allies and the handful of our own men in Europe, struggling against great military odds, with the bulk of our military strength lying impotent upon America's shores, unable to strike a blow in their behalf.

"Fortunately for the United States and the Allies, aeroplanes have wings, and their wings can be enlarged and the aeroplanes can be flown across the Atlantic, leaving our too small tonnage for the transportation of food, men, guns, and the other equipment which is of such vital importance to the cause of the Allies.

"You will be glad to know that in this as in other emergencies, we find that the Aero Club of America's pioneer work enables the country to meet the emergency partly prepared. For six years the Club has been working on the various problems connected with the transatlantic flight, and today the flight looks practical mainly because of its efforts."



THE NEWS OF THE WEEK



Aircraft Production to be Directed From Cleveland

According to newspaper reports the production section of the Aviation Corps of the army is preparing to move its headquarters from Washington to Cleveland, to be closer to the centres of production. Some fifty officers having to do with the stimulation of production will be established there, so they can keep in personal touch with the progress being made.

This change will save much time on the part of aviation experts who are now forced to make frequent trips to Washington for the purpose of consulting with aircraft production authorities.

Canada Conserving Aircraft Lumber

Prohibition has been placed on the exportation to all other places than Great Britain, except under license, of the some 80,000,000 acres of silver spruce, balsam and fir forests, which is required in the construction of aircraft. Sufficient progress in being made in the matter of raw materials to make unnecessary the further distribution of this lumber.

Aircraft on Mexican Border

The Fifteenth Division of the United States Army is organized at the Mexican Border, for the purpose of guarding against the Mexican marauders. At Fort Bliss, El Paso, where the Eighty-second Field Artillery is stationed, is expected a squadron of twelve aeroplanes and other useful units, to supplement the work of the infantry divisions now stationed there.

E. R. Stettinius Named Director of Army Buying

Secretary of War Baker has appointed E. R. Stettinius surveyor-general for all army purchases. He will be in charge of the procurement and production of all supplies for the five army bureaus—ordnance, signal, quartermaster, engineer and medical.

Mr. Stettinius has long been associated with J. P. Morgan & Co., and in this capacity has handled enormous contracts for the allies, and is, therefore, fitted to handle this work for the War Department.

Secretary Baker, in making the announcement of Mr. Stettinius's appointment, said:

"Mr. Edward R. Stettinius, of New York, has been appointed surveyor-general of all army purchases. He will be in charge of the procurement and production of all supplies by the five army bureaus, viz: ordnance, quartermaster, signal, engineer, and medical.

"It will be his duty to co-ordinate such purchases and properly relate the same to industry to the end that the army programme be developed under a comprehensive plan which will best utilize the resources of the country.

"From the outbreak of the war Mr. Stettinius has been in sole charge of the allied purchases in this country and has been responsible for the development of the production of war materials. His intimate knowledge of war conditions in Europe and in the United States, as related to industry and the practical means he has used to accomplish his plans, pre-eminently qualify him for his position.

"Mr. Stettinius will assume his new duties at once and establish his office in Washington."

Dayton-Wright to Build

The Dayton-Wright Aeroplane Co. will start work shortly on a factory 300 by 600. The structure will be two stories and will cost $200,000.

No New Liberty Engine

The Aircraft Production Board declares that the story of a new Liberty motor which is being designed to surpass the present Liberty motor is entirely without foundation. The story has appeared in the general press throughout the United States and was to the effect that new mechanical innovations were to be used and that the present Liberty engine would be inferior to the new one. Howard E. Coffin says that the report is to be entirely discredited and has no foundation.

Liberty Motor King, Says Member of French Military Commission

"The construction of the Liberty motor under the direction of Howard Coffin will solve the problem," declared Major L. C. Eckenfelder of the French Military Commission at the Chicago Banquet of the Society of Automotive Engineers. "It is the motor of the future, the motor of victory.

"Whether the war is to be won by aeroplanes is a question. It is certain, however, we need all the motors, all the aeroplanes America can make, and we need them now. In France the motor is king. You find it everywhere. It changed the tactics of war and upset certain branches, the cavalry particularly."

Major Eckenfelder represented M. Andre Tardieu, French High Commissioner at the banquet of the S. A. E.

Home Defense Protects Standard Plant

The entire membership of the Elizabeth Home Defense League, 160 men, was called into service and sent in haste to guard the plant of the Standard Aircraft Corporation near the Elizabeth-Linden (N.J.) boundary line, where it was said letters threatening to destroy the plant had been received by officers of the company. A telegram to Mayor Mravlag of Elizabeth from Assistant Secretary of the Navy Franklin D. Roosevelt requested the Mayor to send a guard at once to the plant, pending the arrival of state troops or a detail of soldiers from one of the New Jersey camps.

Dirigible Sails Above New York

A cigar-shaped dirigible naval balloon almost 200 feet long sailed over downtown New York and Brooklyn recently. Piloted by Lieut. Commander W. G. Child, U. S. N., it left a coast guard fort at 3.30 P.M. and came in over Brooklyn, flying across Lower Manhattan to the Metropolitan Building at Madison Square. Then it turned back and passed over Governor's Island and South Brooklyn. At one point in its flight the dirigible reached an altitude of 11,000 feet.

Crowds stopped in the streets to watch it pass over them, flying an American flag from its rigging. Experts described it as the "non-rigid" type. With the pilot in the car were Ensigns C. W. Bell and R. C. Gartz. The flight lasted two hours.

Central Park Field Leased

The Hydrerocraft Co. has taken over the lease of the flying field at Central Park for a number of years and will add hangars to the present buildings now there.

Flying instruction will be carried out here, and the natural location of this field together with the fact that it has been used as a testing field by several manufacturers for the past two years, makes this field a center of civilian aerial activity.

Glenn H. Curtiss Buys Estate

Glenn H. Curtiss has purchased for a resident the property of Gage E. Tarbell in Garden City, Long Island. The property was held at $200,000 and is one of the most attractive places in Nassau County. Twelve years ago, when Mr. Curtiss first went to Mineola to try out his aeroplane inventions on Hempstead Plains, he had quarters in a barn on the property of Peter McLaughlin. His new estate is not far from the new $500,000 plant, employing 500 men, which has been erected for construction and experiments.

Goodrich Stock Yields $14.29 Per Share

The B. F. Goodrich Company reported net profits of $10,425,000 after deduction of taxes, including $2,250,000 for estimated allowances for income and excess profits taxes. This is an increased profit of over half a million over last year, when the dividends on each share of common stock totalled $12.76.

Branch of Aircraft Board at Portland, Ore.

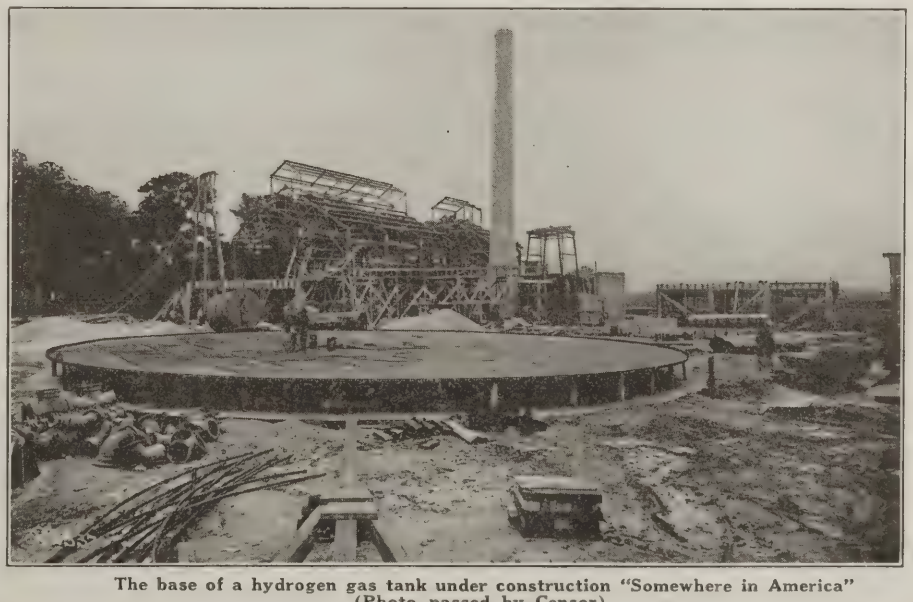
Creation of the Pacific Coast branch of the Aircraft Production Board, with headquarters at Portland, Ore., was announced here today. George S. Long of Tacoma, a lumberman; William M. Ladd of Portland, a banker, and a Colonel of the Army Signal Corps, will compose the branch board. Co-operation of the labor unions in the lumber industry is announced.

Joy to Retire from Lincoln Highway Presidency

Henry B. Joy will retire from the presidency of the Lincoln Highway Assn., and it is rumored that F. A. Seiberling is slated as his successor. A meeting of the association will soon be held, at which the members will talk over the advisability of continuing road work in Utah and Nevada. Seiberling contributed $100,000 for this work, John N. Willys $50,000 and Carl Fisher $25,000.

French Engineers Plan Congress at the Sorbonne

The civil engineers of France are to hold a congress at the Sorbonne, Paris, in March. The third section, which covers the entire question of transportation, has one sub-section dealing with the automobile industry. M. Lumet, who before the war was engineer of the laboratory of the Automobile Club of France, and who will be remembered as the first officer sent to America to purchase army trucks for the French forces, will present a paper dealing with "Industrial Questions: Manufacturing, Standardization, Methods of Work and of Production." Henri Cezanne, who in peace days was general manager of the Paris Automobile Salons, and is still general secretary of the French Automobile Manufacturers' Association, has been scheduled to read a paper entitled "Commercial Question: Sale, Exchange, Customs Duties, Taxes, Production Combines."



The base of a hydrogen gas tank under construction "Somewhere in America" (Photo passed by Censor)

Other papers will be read as follows:

"Best Methods of Developing the Use of Internal Combustion Motors in the Merchant Marine Service," by M. Lumet.

"Formation of Engineers and Technical Employees for the Aviation Industry," by Colonel Roche.

"Aviation Motors," to be dealt with by a commission of which M. Soreau will be the president.

"The Possibilities of Aviaitno After the War," by Colonel Espitallier.

Columbia Orsman in Air Service

Rutherford Stuyvesant Pierrepont, who was stroke and captain of the Columbia varsity eight in 1905, has been appointed a first lieutenant in the Aviation Section of the Signal Officers' Reserve Corps. He is on active duty, awaiting assignment to the Training Section, Radio Department for duty. Recently Mr. Pierrepont has taken a great interest in dog shows and has a fine collection of Brussels Griffons on his estates in New Jersey.

Selection of Aircraft Timber

As an indication of the amount of timber needed for the full development of our aircraft, an authority states that about 200 board feet of wood is used in the actual contruction of the average aeroplane. To obtain this material, it is ordinarily necessary to work over 1,500 feet of select lumber, which often represents all that can be used for aeroplanes of 15,000 board feet of standing timber.

Mr. John P. Myers, the Northeastern representative of the Commission on Training Camp Activities, addressed a meeting of the Woman's Naval Service, at the residence of Mrs. Charles A. Van Rensselaer, Chairman of the Aeronautic Committee of the Woman's Naval Service. Mr. Myers told of the wonderful work his organization is doing for the morale of the National Army, and the great need that has existed for such work.

In speaking of the scope and purposes of the work Mr. Myers stated that the Y. M. C. A. are devoting their energies to the work inside of the camps. The work of the Recreation Centers established by the Commission covers the needs of the men off duty. These men must have some place to go, and the Commission intends that they shall be the right sort of places. He very strongly urged the cooperation of the Woman's Naval Service in the establishment of a recreation center aboard to which men could go on their leave of absence.

The following telegram from Mr. Raymond B. Fosdick, Chairman of the Commission on Training Camp Activities was read:

"I consider your plan to establish recreation center in France for sailors and aviators a very excellent one. You can count upon our support and cooperation in this work."

Mr. Alan R. Hawley, President of the Aero Club of America, told of the important part women have played in the development of aeronautics, and praised highly the work the Woman's Naval Service has done and is doing for aviation. He strongly urged the establishment of places of recreation for aviators.

Mr. Augustus Post, who acted as the Aero Club of America's representative in France during the past summer, said that General Pershing's message to America was that the country should let the boys in France know that the country stood solidly behind them. He said he had learned from his experience in France that the great essential to the Army was morale, and that the recreation centers were the most potent factors in the creation of good morale.



Lieut. "Pat" O'Brien, just got back to his home in Momence, Ill., after escaping from a German detention camp

Miss Alice Carpenter, Chairman of the Woman's Naval Service, gave a brief review of the extensive work the organization has done in providing for the comfort of the men in the navy and in the naval air service.

It is the intention of the Woman's Naval Service to extend their activities, and most particularly, to establish the recreation centers so much needed for the men in the aviation service. Its campaign is to be country-wide, and the committee to carry out the plans will be composed of the prominent women in the leading cities of the country.

Among the ladies who have already consented to go on the Committee are: Mrs. E. H. Harriman, Mrs. William C. Potter, Mrs. Edward Talmadge, Mrs. Henry A. Wise Wood, Mrs. Charles A. Van Rensselaer, Mrs. Gouverneur Morris, Mrs. Horatio H. Slater, of Boston; Miss Alice Carpenter, Mrs. Marion Salzberger, Mrs. M. V. Hoffman, and other prominent New York women.

Further information in regard to the work of the Woman's Naval Service may be had at their headquarters, 289 Madison Avenue.

Alexander McClure With Aerial Age

We take pleasure in announcing that Mr. Alexander McClure has been appointed advertising manager of Aerial Age. Mr. McClure brings to his position a wide and varied experience in journalism, having held responsible positions on periodicals and newspapers not only in the United States, but also in England, South Africa, India, and the Philippines. In the United States Mr. McClure was formerly associated with the Collier's, Nast and Hearst organizations, and with prominent periodicals in the architectural and engineering fields. With his wide international viewpoint, Mr. McClure, as advertising manager of Aerial Age, will render the aeronautic industry constructive service at a time when all far-seeing aeronautical enthusiasts realize the necessity of fundamentally sound work for the era of commercial aeronautics that is fast approaching.

Council of National Defense to Assist in Recruiting Aviators

The State councils' section, Council of National Defense, has sent the following letter to the several State councils:

"Referring to our Bulletin No. 77, having reference to recruiting flying officers for the Aviation Section of the Signal Corps, we are now advised by the personnel officers of the Signal Corps that the conditions which prompted their request for our assistance have changed and that candidates are being enrolled in even greater numbers than the Signal Corps can provide for. This conditions is the result of a more vigorous effort on the part of the regular recruiting channels and certain new regulations of the General Staff, which permit a limited number of regular officers of other branches to become flying officers.

"We have advised the staff of the Signal Corps, as has the Military Training Camps Association, that we are ready at all times to lend any assistance within our power, and in the event that conditions arise in which they will need our assistance they will advise us and we will communicate promptly with you."

Sixty Mile Flight With Broken Wing

With a broken wing, Major C. K. Rhinehardt and Captain J. Phipps, of the Royal British Flying Corps, flying from Fort Worth to San Antonio, were able to escape with their lives due to the courage and the presence of mind of Major Rhinehardt.

The accident occurred when the men had flown 185 miles and was noted when the machine began careening. Captain Phipps left the nacelle and attempted to adjust the struts, but failed.

Major Rhinehardt surrendered the control and by holding the wing in place succeeded in finishing the flight.

U. S. Airman Thrills Yale Club Diners

Lieut. E. M. Roberts, of the Royal Flying Corps thrilled the magazine men who form the Representatives Club with an unassuming, unaffected story of his adventures as a flyer on the western front. He was applauded as was no other member of the group of speakers that included W. Bourke Cockran, Job E. Hedges and Arthur Woods.

His recital of his first flight as the gunner of an aeroplane was the high light of his narrative. A German attacked his machine. He was "frightened stiff," he said, "and his first shots went wild. He adjusted another drum. The German caught all the forty-seven shots as close range and dropped."

Lieutenant Roberts was wounded while on reconnaissance patrol during the Somme offensive and was invalided home.



One of the test hangars of the Fiat Company. Note the excellent door arrangement

NAVAL and MILITARY AERONAUTICS

Special Orders, 18

Elliott Southworth Church appointed as first lieutenant. Report to the Chief Signal Officer.

Appointment of First Lieut. Charles T. Phillips, 5th Georgia Infantry, to the same grade, Aviation Section, is announced.

So much of telegraphic orders from the War Department January 14, 1918, as directs Second Lieut. Paul D. Weathers, Aviation Section, Signal Reserve Corps, to report to Kelly Field, South San Antonio, Tex., for duty is revoked. Lieutenant Weathers will report to the Chief Signal Officer.

So much of telegraphic orders from the War Department January 12, 1918, as directs Second Lieut. Charles F. Curry, Jr., to report to Kelly Field, South San Antonio, Tex., for duty is revoked. Lieutenant Curry will report to the Chief Signal Officer.

First Lieut. Ralph M. Caulkins, Infantry, report at the School of Military Aeronautics, Texas State University.

Special Orders, 19

The appointments of Privates First Class George D. Coleman, Harry P. Disher, and George Newell Hurd as second lieutenants are announced. Report to Kelly Field, San Antonio, Tex.

Appointment of Sewall Cutler as first lieutenant is announced. Report to the president of the aviation examining board, 75 Boylston Street, Boston, Mass.

The appointment of Rutherford Stuyvesant Pierrepont as first lieutenant is announced. Report to the Chief Signal Officer.

Second Lieut. William E. Karns report to Post Field, Fort Sill, Okla.

First Lieutenant Zane I. Adair, Signal Corps, will report to School of Military Aeronautics, Georgia School of Technology.

The following-named officers, Aviation Section, are announced as on duty requiring them to participate regularly and frequently in aerial flights: First Lieuts. John M. Stanley, Roy R. Fetterhog, Richard Anderson.

Appointment of First Lieut. Frederick W. Hellenberg, Infantry, National Army, as first lieutenant in the Aviation Section is announced. Proceed to Post Field, Fort Sill, Okla.

Appointment (promotion) of Second Lieut. Walter C. Hooper, as first lieutenant is announced. Report to the Chief Signal Officer.

Special Orders, 20

Appointment of Edgar Raymond Whitledge as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Burt Alfred Alfred Skellan as first lieutenant is announced. Report in person to the Chief Signal Officer.

Appointment of Clay Littleton as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of John Samuel Martin Eley as captain is announced. Report in person to the Chief Signal Officer.

Appointment of William A. Jones, Jr., as second lieutenant is announced. Report to Love Field, Dallas Tex.

Appointment of Robert Butler Lindsey as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Edward Lewis as first lieutenant is announced. Report to the Chief Signal Officer.

Following-named officers report to Kelly Field, South San Antonio, Tex.: First Lieut. Lowell H. Smith, First Lieut. John H. Dumas, Second Lieut. George M. Engle, Second Lieut. Harold V. Grenawalt, Second Lieut. Kenneth C. Fouts.



Gen. J. D. Cormac of the British War Mission in this country

First Lieut. Claudius F. Bullock, Medical Reserve Corps, is assigned to active duty with the Aviation Section, Signal Corps, and will proceed to Charleston, S. C., and report in person to the officer in charge, physical examining unit, Roper Hospital, for duty as medical member of examining board and recruiting officer and by letter to the Chief Signal Officer, United States Army, Washington, D. C. The travel directed is necessary in the military service.



Lieut. Alexander Blair Thaw, with the American Air Service in France

Following-named officers report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.; Second Lieut. Aquila N. Volkhardt, Second Lieut. Albert A. Drieu, Second Lieut. Daniel A. Dargue.

Appointment of Harley Franklin McCurdy as first lieutenant is announced. Report in person to the Chief Signal Officer.

Appointment of Maurice Jackson Carey as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Edgar Lyman Bradley as second lieutenant is announced. Report aviation concentration camp, Morrison, Va.

Appointment of Herbert Eugene Ives as captain is announced. Report to the Chief Signal Officer.

Appointment of Joseph Orrin Donovan as captain is announced. Report to the commanding officer, School of Military Aeronautics, Georgia School of Technology.

Appointment of Theodore Harbour Bailey, Jr., as second lieutenant is announced. Report to Langley Field.

Appointment of Warner Dayton Orvis as second lieutenant is announced. Report to Capt. R. S. Rainsford at the office of the district manager of inspection, New York, N. Y.

Second Lieut. John A. Schreiber report to Carlstrom Field, Arcadia, Fla.

First Lieut. Robert William Saenger report to Kelly Field, South San Antonio, Tex.

First Lieut. John N. Clayton report to Kelly Field, San Antonio, Tex.

Second Lieut. Wallace J. Frost report to the Chief Signal Officer.

The following-named officers report to Kelly Field, South San Antonio, Tex.: First Lieut. Arthur W. Vanaman, First Lieut. Web Maddox, First Lieut. Joe Lanier Nix, Second Lieut. Charles W. Fuller, Second Lieut. Lawrence Hills, Second Lieut. Jewel W. Kaufman.

Capt. William J. Turner report to Massachusetts Institute of Technology, for a course of instruction.

Appointment of Capt. Mark H. Evans, Infantry, National Army, as captain is announced. Report to Kelly Field, South San Antonio, Tex.

Appointment of Capt. Philip H. Elwood, Field Artillery Reserve Corps, as captain in the Aviation Section is announced. Report Kelly Field, South Antonio, Tex.

Capt. Roy Sylvander Younglove report to Engineer Officers' Training School, Massachusetts Institute of Technology.

Following-named officers report aviation general supply depot, Garden City, N. Y.: First Lieut. Ralph M. Phelps, Second Lieut. Charles Netcher.

The appointment of First Lieut. Hubert O. Cain, Infantry Reserve Corps, as first lieutenant in the Aviation Section is announced. Report to Kelly Field, San Antonio, Tex.

First Lieut. Floyd W. Burns, Medical Reserve Corps, is relieved from duty at Camp Beauregard, Alexandria, La., and will proceed to Houston, Tex., and report in person to the commanding officer, Signal Corps Aviation School, Ellington Field, that place, at the earliest practicable date for duty with Aviation Section, Signal Corps, and by letter to the Chief Signal Officer, United States Army, Washington, D. C. The travel directed is necessary in the military service.

First Lieut. Homer B. Albro on duty requiring regular aerial flights.

Appointment of Herbert Angus Conners as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Charles Kent Henninger as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Alfred Wilson Harris as major is announced. Report to the Chief Signal Officer.

Appointment of James Audelbert Allen as first lieutenant is announced. Report in person to the Chief Signal Officer.

Appointment of Gene H. Fonda as captain is announced. Report to the Chief Signal Officer.

Appointment of Robert Edward Hine as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of John Albert Hitchens as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Richmond Rochester, Jr., as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Sergt. Norman Lawson as second lieutenant is announced. Report Taylor Aviation Field, Montgomery, Ala.

Appointment of Herbert Harvey Parents as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of William John McKelvey as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of William Van Kirk as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Joseph Fletcher Holmes as captain is announced. Report to Col. Brice P. Disque, Yeon Building, Portland, Ore.

Second Lieut. Clarence F. Connor report to Camp Sevier, Greenville, S. C.

Appointment of Henry Maurice Darling as captain is announced. Report to the Chief Signal Officer.

Sergts. First Class Isiah Davies and John T. Grimble, Aviation Section, Signal Corps, on duty with the 142d Aero Squadron at Rockwell Field, San Diego, Cal., are announced as being rated aviation mechanicians, to date from January 21, 1918.

Second Lieut. George B. Barrett report to Kelly Field, San Antonio, Tex.

Second Lieut. Clifford T. Day report to Kelly Field, South San Antonio, Tex.

Appointment of James Craige Fleming as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of John William Lane, Jr., as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Joseph C. N. Rowell as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Clarence Berry Mitchell as first lieutenant is announced. Report to the Chief Signal Officer.



Lieut. Flachaire, the first French Ace to fly over New York's skyscrapers

Appointment of Charles Earle Townsend as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Sergt. Charles F. Huntington as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Richard Howard Randall as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of George Osmar Raynolds as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Herbert Nelson Williams as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Hugh Burgess Giles as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of John Leo Bender as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of John Ralph Kearns as first lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Sergt. Samuel Cottrell Gordon, 305th Ammunition Train, as first lieutenant in the Aviation Section is announced. Report to the Chief Signal Officer.

Special Orders, 21

Private Russell Ray, report to aviation general supply depot, Morrison Va.

Sergt. First Class Henry R. Briggs, Washington Barracks, D. C., sent to Vancouver Barracks, Wash.

Capt. William T. Owens, Medical Reserve Corps, is assigned to active duty, in time to comply with this order, with the Aviation Section, Signal Corps, and will proceed to Admiral, Md., and report in person to the commanding general, Camp Meade, that place, February 4, 1918, for duty as junior member of physical examining unit, medical member of examining board, and recruiting officer, and by letter to the Chief Signal Officer, United States Army, Washington, D. C. The travel directed is necessary in the military service.

Appointment of Private First Class Merrill Bruce Moores as first lieutenant is announced. Report to School of Military Aeronautics, Massachusetts Institute of Technology.

Appointment of Elisha Carrington Howes, Jr., as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Private Joseph Hobson O'Connell as second lieutenant is announced. Report to Photographic School Detachment, Cornell University, Ithaca, N. Y.

Appointment of Charles William Muldoon as second lieutenant is announced. Report to the Chief Signal Officer.

Appointment of Clarence B. Swayne as second lieutenant is announced. Report to School of Military Aeronautics, Georgia School of Technology.

Appointment of Charles Sanders Bouchard as second lieutenant is announced. Report in person to the Chief Signal Officer.

Appointment of Private First Class Harold George Miller as second lieutenant is announced. Report to the district manager of inspection, Dayton, Ohio.

Appointment of William D. Irvine as first lieutenant is announced. Report at Rich Field, San Antonio, Tex.

Appointment of Albertus True Dudley as first lieutenant is announced. Proceed to Detroit, Mich., and report to the president of the aviation examining board at Harper Hospital.

Appointment of Private First Class Felix Borzynski as second lieutenant is announced. Report to Kelly Field, No. 2, San Antonio, Tex.

First Lieut. Robert L. Massey, Jr., report to Rich Field, Waco, Tex.

The following-named officers of the Medical Reserve Corps are assigned to active duty with the Aviation Section, Signal Corps, and will



Italian aeronauts examining French Nieuport operating on the Southern Front © Kadel & Herbert

proceed to Rantoul, Ill., and report in person to the commanding officer, Signal Corps Aviation School, Chanute Field, that place, for duty and by letter to the Chief Signal Officer, United States Army, Washington, D. C.: First Lieuts. Edwin K. Allis, Jay T. Wood, Joseph T. Woodward, Ross D. Wright. The travel directed is necessary in the military service.

Special Orders 14-15

Second Lieut. Maurice S. Shafter, Infantry Reserve Corps, appointed second lieutenant, Aviation Section. Report at McCook Field, Dayton, O.

Appointment of William Augustine Scully as captain announced; report to Chief Signal Officer.

Appointment of Jesse Coates as major announced; report to Chief Signal Officer.

Appointment of Bert Robertson as second lieutenant announced; report to Chief Signal Officer.

Appointment of Eugene Arthur Hults as first lieutenant announced; report to Chief Signal Officer.

First Lieut. Harold S. Kennedy report to aviation general supply depot, Garden City, Long Island, N. Y.

The following officers to report to Kelly Field, South San Antonio, Texas: First Lieut. Carrol V. Stein, First Lieut. Paul Wilder, First Lieut. Edward L. Williams, Jr., Second Lieut. Frank H. Stone, Second Lieut. Neal Thompson, and Second Lieut. Bidwell A. Wright.

Appointment of Corpl. Edwin F. Atkins, Jr., Maine Heavy Field Artillery as second lieutenant announced; report to Chief Signal Officer.

Appointment of John Albert Blair as second lieutenant announced; report to Chief Signal Officer.

Appointment of Philip Charles Baer as first lieutenant announced; report to Chief Signal Officer.

Appointment of Donald G. Keeble as first lieutenant announced; report to Chief Signal Officer.

Appointment of Clarence John Prendergast as second lieutenant; report to Chief Signal Officer.

First Lieut. Townsend J. Taylor and First Lieut. Beverly V. Thompson report to aviation general supply depot, Garden City, Long Island, N. Y.

Appointment of Miller Smith Tyson as second lieutenant announced; report to Chief Signal Officer.

Appointment of Sydney W. Caulfield as second lieutenant announced; report to station at New Haven, Conn., and wire Chief Signal Officer.

Appointment of Carleton Couch Hungerford as captain announced; report to Chief Signal Officer.

Appointment of John Garfield Milburn as first lieutenant announced; report to Chief Signal Officer.

Appointment of Roland Ludington Hustis as first lieutenant announced; report to Chief Signal Officer.

First Lieut. Walter Rowson, I. R. C., proceed to School of Military Aeronautics, University of Texas, Austin, Texas.

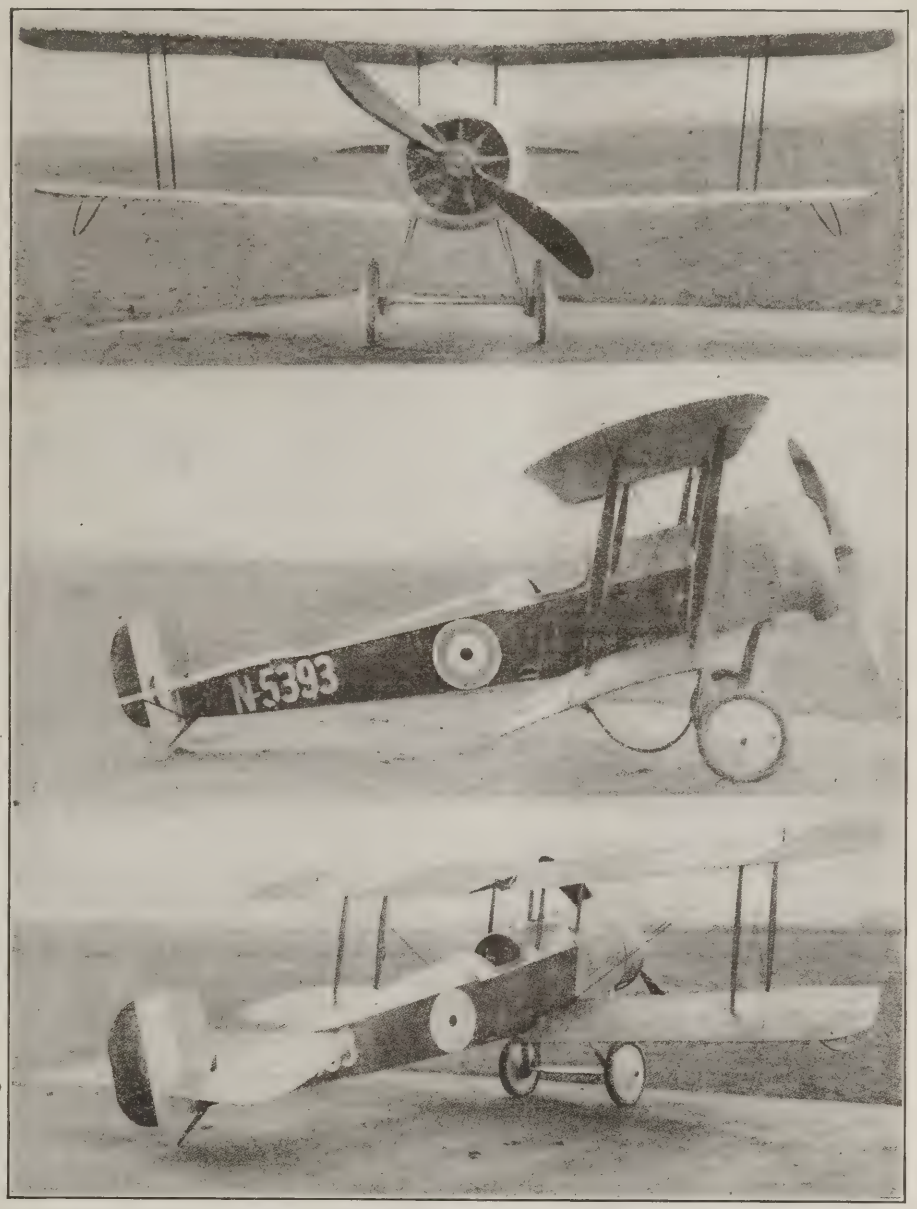
Appointment of Leonard Colton Hanna, Jr., as second lieutenant announced; report to Chief Signal Officer.

Appointment of Second Lieut. Roy W. Gottschall, F. A. R. C., as second lieutenant, Aviation Section, announced. Report School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

Pvt. Milton W. Griggs, S. E. R. C., appointed second lieutenant, Aviation Section; report chief of Equipment Division, Inspection Section, office of Chief Signal Officer for duty.

Second Lieut. Ralph A. Gibson, National Army, appointed second lieutenant, Aviation Section; report School of Military Aeronautics, Georgia Institute of Technology, Atlanta, Ga.

Second Lieut. William T. I. Hall, 111th Infantry, proceed to School of Military Aeronautics, University of Texas, Austin.



Three views of the Bristol Bullet, a single-seater fighter. (British official photo)

Second Lieut. George S. Warren, 39th Infantry, proceed to School of Military Aeronautics, University of Texas, for training as pilot.

Second Lieuts. William H. Knowles and John W. Dennison report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston.

Appointments of following-named members of the Signal Enlisted Reserve Corps as second lieutenants, Aviation Section, Signal Corps, announced; report to Kelly Field, San Antonio, Texas: Prvts. Charles Adolph Chalaron, Wolbur H. Downs, William H. Hamilton, Christian H. W. Laecke, Travis S. Masterson, George P. Shillinger, Joseph Matheison, John M. Thompson, Jr., and Master Signal Electrician Clyde Bruce Hamlin.

Capts. Ralph Sanger and Emlen M. Drayton report to School of Military Aeronautics, Austin, Texas.

First Lieut. Louis Freeman Plummer, Aviation Section, Signal Corps, report to Gerstner Field, Lake Charles, La.

First Lieut. Forrest H. Longeway and First Lieut. Harry O. McDougall report to Rockwell Field, San Diego, Cal.

Second Lieut. George Leo Searle report to Chief Signal Officer.

Second Lieut. Stacy O. Sears report to Post Field, Fort Sill, Okla.

First Lieut. Richard C. Longnecker report to Kelly Field, South San Antonio.

First Lieut. Benjamin H. Adams report to School of Military Aeronautics, Ohio State University, Columbus.

First Lieut. Thomas Fowler report to School of Military Aeronautics, Georgia School of Technology, Atlanta, Ga.

Following members of S. E. R. C. appointed second lieutenants, Aviation Section, Signal Corps, and report to Army Balloon School, Fort Omaha, Neb.: Sergt. Cleves S. Fisher, Prvts. John A. Allen, Peter Ferguson Allan, Martin H. Andrews, Howard B. Blanchard, Forrest D. Bardshaw, Don Cameron, Philip B. Chase, Edward Evans Denniston, James H. Fergunson, Edward M. Gallagher, Grosvenor E. Glenn, Vincent J. Hoye, Robert Victor Ignico, Chester J. Shar and William E. Woodman.

Capt. Charles R. Forrest, First Lieuts. John Burton and Cyrus E. Clarkson report to Rockwell Field, San Diego, Cal.

The following officers to report to Balloon School, Fort Omaha, Neb.: First Lieut. Wriston C. Alexander, First Lieut. Edward Glick and Second Lieuts. Benjamin E. Hayman, Homer MacNeill, Rascian S. McMichael, George M. Osborn and Charles C. Parsell.

Following officers report to Gerstner Field, Lake Charles, La.: First Lieuts. Louis M. Briggs, John R. Burns, Charles T. Duddleston, Leland C. Hurd, Urbang Robbins and Frank D. Healey, and Second Lieut. Lee Deutsch.

Following officers report to aviation supply depot, Garden City, Long Island, N. Y.: First

Lieut. John K. Grisard, First Lieut. Edward Gretcccless, Jr., Second Lieut. Perry H. Aldrich.

Following officers report to Chanute Field, Rantoul, Ill.: First Lieut. Benjamin H. Adams and Second Lieut. Bethell Edrington.

Prvt. Roy Diefenderfer Harris, S. E. R. C., appointed first lieutenant, Aviation Section, Signal Corps. Report to School of Military Aeronautics, Georgia Institute of Technology, Atlanta, Ga.

Walter Joseph Enright appointed first lieutenant; report to Aviation Experimental School, Langley Field, Hampton, Va.

Claud E. Frieder appointed second lieutenant; report Signal Corps, Vancouver Barracks, Washington.

Appointment of Alexander Gray Churchward as second lieutenant annuonced; report to Chief Signal Officer.

Appointment of Prvts. Clarence Leslie Solomon and Edgar Rapelye Case as second lieutenants announced; report Signal Corps Concentration Camp, Garden City, Long Island, N. Y.

Appointment of Elmo Neale Pickerill as first lieutenant announced; report Ellington Field, Houston, Tex.

Appointment of Frank Hamilton Clewers as second lieutenant announced; report to Chief Signal Officer.

Appointment of Glenn Scott Cob as second lieutenant announced; report to Chief Signal Officer.

Appointment of Robert Lee Dillenbeck as second lieutenant announced; report to Chief Signal Officer.

Appointment of Alpheus Culter Bemis as first lieutenant announced; report to Chief Signal Officer.

Appointment of William B. Osgood Field as first lieutenant announced; report to Chief Signal Officer.

Second Lieut. William Arnold Taylor report to School of Military Aeronautics, Institute of Technology, Cambridge, Mass.

First Lieut. Willis D. Helms report to School of Military Aeronautics, Georgia School of Technology, Atlanta.

Capt. Rex R. Gardner report to Col. Brice P. Disque, Portland.

First Lieuts. Frank C. Hendry, Morris Berman and Louis H. Bailey report to School of Military Aeronautics, Georgia Institute of Technology, Atlanta, Ga.

First Lieut. Walter S. Wanamaker report to Fort Worth, Texas.

First Lieut. Michael B. Carter report aviation supply depot, Garden City, Long Island, N. Y.

First Lieut. Zene C. Ross report Kelly Field, San Antonio, Tex.

First Lieut. Phil. Billard report aviation general supply depot, Garden City, Long Island, N. Y.

Following first lieutenants report Park Field, Millington, Tenn.: William A. Frye, Pay L. Wakin, Cecil H. Braddick, Maple D. Shappell, Joseph L. Marriatt, Harold A. Lorenz, Lawrence C. Mann and Clarence E. Hyde.

First Lieut. Walter V. B. Roberts report School of Military Aeronautics, Princeton, N. J.

Prov. Second Lieut. Eugene F. Gillespie, 7th Infantry, report School of Military Aeronautics, University of Texas, Austin, for instruction.

First Lieut. Clifford G. Sample report Wilbur Wright Field, Fairfield, Ohio.

First Lieut. John De St. Mart report Gerstner Field, Lake Charles, La.

First Lieut. Milard E. Rollins report Call Field, Wichita Falls, Tex.

First Lieut. William Raymond Kuhn report McCook Field, Dayton, Ohio.

First Lieut. William H. Miller report Post Field, Fort Sill, Okla

Second Lieut. Peter Headerson report Kelly Field, San Antonio, Tex.

Major J. Paulding Edwards report repair depot, Dallas, Texas.

Second Lieut. William F. Simrall report School of Aerial Photography, Cornell University, Ithaca, N. Y.

Following officers report at Fort Sill, Okla: First Lieuts. James W. Lavers, George C. Johnson, Leo J. Griffin, Theodore S. Straw and Second Lieuts. Robert S. Olmstead and Harvey H. Holland.

First Lieuts. James T. McAteer and Irving D. Stone report to Scott Field, Belleville, Ill.

Second Lieut. Leon J. Soisson report to Chief Signal Officer.

Second Lieut. Chester Warlow report Kelly Field, San Antonio, Tex.

First Lieut. Ralph Jacob Johnson report Gerstner Field, Lake Charles, La.

First Lieut. Archibald B. Johnston report Gerstner Field, Lake Charles, La.

First Lieuts. Cornelius Harry Caddegan and Willson Shaw McClintock report Kelly Field, San Antonio, Texas.

Appointment of Francis Edgar Haag as captain announced; report to Chief Signal Officer.

Appointment of Prince Albert Oliver as major announced; report at Adjutants' School, Ohio State University, Columbus, Ohio.

Appointment of Joseph Lewis Carll as first lieutenant announced; report to Chief Signal Officer.

Appointment of Sergt. First Class Ralph Estes Whittle to first lieutenant, Aviation Section, Signal Corps, announced; report to Chief Signal Officer.

Appointment of Sergt. William W. Riegel, 84th Aero Squadron as first lieutenant announced. Report at School of Military Aeronautics, Georgia School of Technology, Atlanta.

Appointment of James Covington Calvert as captain announced; report to Chief Signal Officer.

Following officers report to Kelly Field, San Antonio, Texas: First Lieuts. Robert Burnett, James C. Fair, Marvin D. Hodges, Earl McDonald, Francis M. McGoldrick, Albert W. Newhall, Jonathan W. Old, Harry C. Powell, Second Lieuts. Herbert A. Baker, William O. Bosworth, Paul J. Corn, Harold B. Curtis, Aubery Drury, Daniel B. Ingiberson, Dale M. King, George D. Litherland, William G. Marvin, Eugene A. Murphy, Guy O. Neal, Cedric D. Price.



Diagram of the German aeroplanes that have been used during 1917.

© The Aeroplane (London)

AERONAUTICS IN THE SENATE

ON January 29th and 30th hearings were held by the Senate Military Affairs Committee on the aeronautic situation. The stenographer's reports of the hearing, as published in the New York *Tribune*, are as follows:

Mr. Chamberlain and his associates heard Howard Coffin, Chairman of the Aircraft Board, testify on the subject of aviation, January 29, in closed session. Judging from the comments of members of the committee, the report he had to give of aviation work made a decidedly favorable impression upon his hearers.

One important point Mr. Coffin made was that aeroplanes are now being sent abroad from this country for both fighting and training purposes.

On January 30 Colonel E. A. Deeds was before the Senate Military Affairs Committee. Colonel Deeds, assistant to Major General Squier, chief signal officer of the army, said that not a single machine of the exact type planned when Congress appropriated $640,000,000 for an air fleet will see service in France.

Colonel Deeds said that the tendency was toward machines of greater power, and that valuable lessons in this respect had been learned at the last battles about Verdun. He believed that the machine now being manufactured and sent to France not only would meet present requirements, but would excel anything the enemy may produce in some time to come.

Colonel Deeds said four types of machines were being manufactured—elementary training, advanced training, combat and bombing. Contracts have been let for 5,350 of the elementary type, first used by the students; 2,153 have been completed, and contracts had been awarded for 1,400 of the advanced training type. Information about the combat and bombing craft was withheld.

Contracts for the aviation service, however, exceed in the aggregate the $640,000,000 provided by Congress, and are distributed as follows: $194,000,000 on fixed prices contracts, $285,000,000 for those on cost plus percentage basis, and $255,000,000 in foreign contracts with France and Italy.

The committee was told that contracts had been awarded to sixty-five firms and that four hundred sub-contractors were working.

To emphasize the rapidity of manufacture in spite of delays and unusual conditions, the colonel said, the Handley-Page, an English machine, was being manufactured now in the United States, although final drawings for it were received only four weeks ago. Two weeks ago specifications for a Caproni model were received, and work already is progressing on that, he said. The very large Caproni triplane experimented with here some months ago was not practicable, in the opinion of signal corps officers, and a smaller model is being made.

Colonel Deeds stated that the signal corps was disbursing about $2,000,000 daily, but that the organization had been so perfected that no invoice remained in the offices more than twenty-four hours.

Senator Frelinghuysen inquired regarding the Fowler Airplane Company, of California. Colonel Deeds said its president was an expert aviator and that the company had contracts for fifty training machines at $325,000 for the San Diego aviation school.

"You gave them the contracts simply because Senator Phelan and Representative Kahn, of California, requested it?" asked Senator Frelinghuysen.

"They probably influenced it," colonel Deeds replied, adding, however, that the order to the Fowler company was small and it had produced first class machines. He also pointed out that Fowler himself was a man of broad experience.

"It seems to me that some of these companies were organized simply to get government contracts or had been promised them," said Senator Frelinghuysen.

The Engel Aircraft Contracts

The Senate Military Affairs Committee developed the fact that Secretary Baker's brother, H. D. Baker, of Cleveland, got contracts to manufacture spare parts of aeroplanes. The amount of the contracts was $921,000. H. D. Baker was a former employe of the city of Cleveland.

Colonel Deeds, who told the story of Mr. Baker's contracts under questioning from Senator Frelinghuysen, said that the Engel company, of which H. D. Baker was president, was doing good work in the performance of its contracts.

Secretary Baker gave no date for his brother's severance of relations with the company. Of the three contracts which the Engel company has for aircraft parts, the first was made in October and the last only a few days ago.

That committee has been severely critical of contracts that were held by persons connected with the government, especially with the Council of National Defence, or held by members of their families. It has been opposed to the policy of secrecy with regard to contracts which was pursued by the War Department, and which made possible this contract with H. D. Baker. When Secretary Baker was on the stand on January 10 he was asked about this policy as follows:

Senator McKellar: "Mr. Secretary, do you think that is a wise governmental policy—that policy of secrecy about contracts?"

Secretary Baker: "Yes, sir; I thought it was necessary under the circumstances, Senator."

Senator McKellar: "Do you still think it is necessary?"

Secretary Baker: "I am inclined to think it still may be necessary."

The official stenographic report of the proceedings today follows:

Senator Frelinghuysen: "What contracts has the Engel Aircraft Company, at Niles, Ohio?"

Colonel Deeds: "The Engel Aircraft Company has contracts for spare parts for aeroplanes. There are three contracts, of small size, one dated October 25, another January 8 and another January 22."

Senator Frelinghuysen: "How much in amount are they?"

Colonel Deeds: "$921,000."

The Chairman: "Altogether?"

Colonel Deeds: "Altogether; the total of it."

Senator Frelinghuysen: "Well, that company was organized for the purpose of making spares, was it not?"

Colonel Deeds: "It was organized for the purpose of making aircraft, I think. Mr. Engel, of that concern, was a former employe of the Curtiss company and had a small organization that had been building flying boats in a small way. I think he was sent as a representative of the Curtiss company at one time to Spain and to some of the other foreign countries to help them get 'plane production started. He had had quite a little experience, and some company was organized around that experience that took over a truck company, a very large plant, the photographs of which we have here, for the making of aircraft."

Senator Frelinghuysen: "Who organized the company?"

Colonel Deeds: "The company is composed of H. D. Baker, president, and A. J. Engel, engineer."

Senator Frelinghuysen: "Is Mr. Baker a brother of the Secretary of War?"

Colonel Deeds: "Yes, sir."

Senator Frelinghuysen: "Who made this contract with Mr. Baker?"

Colonel Deeds: "That was made through the regular channels of the equipment division."

Senator Frelinghuysen: "And did you have anything to do with it?"

Colonel Deeds: "Well, as chief of the equipment division I would be responsible for the work. The plant was inspected by Major Sheppler and others of the organization. I might say that it is a very competent little outfit they have there and is doing a very good job."

Senator Frelinghuysen: "Did you investigate the financial responsibility of the Engel Aircraft Company?"

Colonel Deeds: "I think we have data here about them."

Major Brown interrupted with: "No, I haven't them here. I am just trying to see if the War Credits Board had made any advance. It has not."

The Chairman: "When was the company organized?"

Colonel Deeds: "I do not know the date of the organization. Have you it there, Senator?"

Senator Frelinghuysen: "Yes, I have a statement here of the company, as I have of all the companies that have been doing business, and I will read it into the record, if I may. It is November 17, 1917, and one dated December 14, 1917. I will give it to you:

"Engel Aircraft Company, The, manufacturers aeroplanes, Niles, Trumbull County, Ohio.

"H. D. Baker, president.

"A. J. Engel, vice-president.

"George S. Patterson, secretary and treasurer.

"November 17, 1917.

"Officers, together with T. E. Thomas, officially connected with the Niles Fire Brick Company, Niles, Ohio; F. C. Case, president of the Lamson & Sessions Company, Cleveland; W. D. Sayle, president of the Cleveland Punch and Shear Company, Cleveland; J. H. Fuller, vice-president of the Cuyahoga Builders' Supply Company, Cleveland, and S. L. Pierce, identified with the S. L. Pierce Company, Cleveland, compose the board of directors.

RECORD

"Incorporated July 15, 1917, under Ohio laws and purchased the assets of the Engel Airplane and Motor Company, of Buffalo. They maintained temporary offices at 1729 East Twenty-second Street, Cleveland, until recently.

STATEMENT

"The following signed statement received by mail, over the signature of G. W. Hafner, auditor, purporting to represent their condition as under date of October 31, 1917. Authorized capital stock, $3,000,000, par value $100; amount paid in, in cash, $38,610; otherwise than in cash, $2,225,000, represented by land, plant, machinery and equipment and good-will.

ASSETS

"Real estate and buildings, $162,422.91.

"Machinery and plant, $70,702.32.

"Stock on hand, raw and finished, $7,523.37.

"Accounts, receivable, considered good, $3,114.24.

"Cash on hand, $500.

"Cash in bank, $13,079.94.

"All assets, exclusive of patent rights, $2,007,498.61.

"Total, $2,264,841.39.

LIABILITIES

"For services, $1,231.39.

"Paid in capital, $2,263,610.

"Total, $2,264,841.39.

"Insurance on merchandise, buildings and plant, $250,000.

"In addition, under date of November 15, 1917, to the above Mr. Hafner and George S. Patterson, secretary and treasurer, advised verbally as follows: $1,000,000 of the capital stock represents seven per cent cumulative preferred, which must be retired before the $2,000,000 of common participates in any common dividends; that $1,000,000 of the common stock has been issued for goodwill, organization, etc.; that the other million dollars of common stock has been issued outright to H. D. Baker, president, with the understanding that one share of common stock is to be given free with each share of preferred stock sold; in other words, the preferred stock representing the cash capital put into the business; that the company has purchased the real estate, plant and equipment of the Niles Car and Manufacturing Company for $225,000, and that the stockholders in turn have agreed to take in like amount stock in the above concern, the arrangements being that the deed for the property is to be turned over as soon as $225,000 of the preferred stock is subscribed.

"Of the $1,000,000 preferred stock they advised that approximately $600,000 has been subscribed to date, the first issue of the preferred stock representing $500,000 to be paid in ten equal payments and subject to call; that the second issue of $500,000 of preferred stock is to be in five equal payments, 20 per cent down and 20 cent payable each month thereafter; that $38,610 principal of the first issue has been paid in cash. Further advised that they have a large contract with the government for the manufacture of aeroplanes and are now starting to operate.

General Information

"The plant which they take over is quite a large one, well equipped, and with some little changes can be made adapatable and suitable for their purchases. H. D. Baker is a resident of Cleveland, and for several years was head of the purchasing department for the City of Cleveland under the administration of Mayor Johnson, and later represented Johnson's interests at Lorain, Ohio.

"Mr. Engel was for a number of years in the employ of the Curtiss Airplane Company and has a great deal of experience in this line. Mr. Patterson is a resident of Cleveland, and for several years has been identified with automobile business, principally in organization work. The active parties connected are men in good personal standing and regarded capable.

"The real estate, buildings, machinery and plant, as mentioned in assets, with the exception of approximately $8,000, constitute the plant, real estate, etc., taken over from the Niles Car and Manufacturing Company.

"New York 11-21-17 MB."

Senator Frelinghuysen: "Was this concern organized to take over this contract?"

Colonel Deeds: "No; it was organized before the contract was given."

Senator Frelinghuysen: "Did you have any conversation with the president of the company or any one connected with it before they purchased this property regarding a contract?"

Colonel Deeds: "Mr. Baker I had one conference with, but I do not recall the details of it. It was back early in the year when I told him we had not anything for anybody who did not have a plant and equipment."

Senator Frelinghuysen: "Then did you not tell him at that time that if he would get a plant you would give him some business?"

Colonel Deeds: "No; he was not told that. I got this from Major Sheppler; I do not know the details, because I have not seen the plans, and I have not had anything to do with the negotiation of this, but I have known in a general way of that being carried on—that they went into this in a very thorough way, equipping the plant."

Senator Weeks: "Who is Major Sheppler?"

Colonel Deeds: "Major Sheppler is head of the production section of the equipment division."

Senator Frelinghuysen: "Is he a regular army officer?"

Colonel Deeds: "No, he was the former production manager for the Willys-Overland Company, and they did equip a plant and start to make these parts, and came down and were given a contract when they were able to show that they were in a position to do the work."

The Chairman: "Was that advertised, or was there any competition on that contract?"

Colonel Deeds: "It is a cost plus contract."

Senator Hitchcok: "What was the date of your first conversation with Mr. H. D. Baker?"

Colonel Deeds: "I cannot give the date, but it was some time in June, I presume."

Senator Sutherland: "Was there a contract preceded by a general understanding that they would get it, so that they went ahead to buy all those plants, make this incorporation and issue this stock?"

Colonel Deeds: "They were given no such assurance at all."

Senator Sutherland: "They just went ahead on their own account?"

Colonel Deeds: "They went ahead on their own responsibility entirely."

Lieutenant A. D. Farwell (signal corps): "They were flatly turned down."

Colonel Deeds: "They were flatly turned down."

Lieutenant Farwell: "Yes, sir; and they went ahead on their own responsibility and equipped, entirely."

Senator Hitchcock: "Did Mr. Baker want a contract without having a plant?"

Colonel Deeds: "I think he was one of hundreds of others who came down to find out what the policy was and what the situation was, and he was told, among others, that unless there were a plant and an equipment and they could show that they could produce the contracts would not be given."

Senator Weeks: "Colonel, would it be unusual for a concern wishing to do business at this time to be told that if they had a suitable equipment and were suitably financed, they would be given their share of the business, or something of that kind?"

Colonel Deeds: "Yes, they would be given an opportunity to figure on the business. That was done."

Senator Weeks: "Was it done in this case?"

Colonel Deeds: "I did not do it; but it may have been done by somebody in the department."

Senator Hitchcock: "Had Mr. Baker any previous experience in manufacturing aircraft and parts?"

Colonel Deeds: "He had not, but Mr. Engel had had considerable experience."

Senator Hitchcok: "Was he at that time associated with Mr. Engel?"

Colonel Deeds: "I do not know whether he was or not, or whether he was being considered at that time."

Senator Hitchcock: "He did not give you any idea of his associates?"

Colonel Deeds: "Not then; not at the time of the conference I had with him."

Senator Hitchcock: "What reasons did he give for indicating his qualifications to manufacture aircraft?"

Colonel Deeds: "Well, he said that there was, as I recall, a plant with trained men that could be provided, but he did not go any further than that and I did not pursue the inquiry, I remember, then because there was no time, and things were not in shape and we were not interested."

Senator Hitchcok: "Did he come to you again?"

Colonel Deeds: "He did not come to me that I know of. He came to the department quite frequently, I think, as others did."

Senator Hitchcock: "You mean to the signal department?"

Colonel Deeds: "Yes, to the equipment division."

Senator Hitchcock: When did Mr. Engel first appear in the matter?"

Colonel Deeds: "I do not have the date of that. Have we any information about that?"

Lieutenant Farwell interjected: "He was part of the company at the very first."

Senator Hitchcock: "The company was not organized until last June, was it?"

Colonel Deeds: "The company was not organized until then. It was organized subsequent to the date of the organization Senator Frelinghuysen has just given here, and that was the time he evidently appeared on the scene."

Senator Sutherland: "Why were they turned down in the first instance?"

Colonel Deeds: "They had no plant or equipment."

Senator Sutherland: "They had nothing except a paper company when they first came to you for a contract?"

Colonel Deeds: "Well, I don't know whether they had that. I do not remember the details. It was several months ago."

Senator Hitchcock: "It was just Mr. Baker personally at that time; there was not any company?"

Colonel Deeds: "So far as I know there was no company at that time. I only know this, that they are doing a very good job of work now. That is the report we get on them."

Senator Frelinghuysen: "What percentage is that contract at?"

Colonel Deeds: "Can we answer that?"

Major Brown: "It does not show whether it is cost-plus or not."

Colonel Deeds: It is for spare parts."

Lieutenant Farwell: "It is a straight priced contract."

Major Brown: "Evidently a straight price, because the figures are not given here."

Colonel Deeds: "It is a straight priced contract, based on figures that have been got by our accountants in the other factories doing the like work."

Senator Frelinghuysen: "Have you encouraged organizations to buy plants and men to buy plants, stating that they would get government contracts?"

Colonel Deeds: "No, sir, we have not. We have rather taken the other attitude generally on this proposition."

The Spruce Situation

Inability to get an adequate supply of spruce is hampering the aviation construction program, the Senate Military Affairs Committee learned today from several witnesses who set forth a variety of reasons for this situation.

Failure to place an official with full authority to act in the lumber district of the Northern Pacific States, and an unwillingness on the part of great lumber interests to cut sufficient timber to produce the kind of spruce needed, were two of the causes advanced.

Major Charles R. Sligh, who was removed from the Aircraft Production Board where he had charge of wood production, was one of the chief witnesses. Colonel R. L. Montgomery, Chief of the Equipment Division of the Signal Service, told the committee that Major Sligh was removed because heads of the service believed the production of spruce was being delayed. Major Sligh testified that he was removed because he was too active to suit members of the Lumber Committee of the Council of National Defense.

Major Sligh told the committee that George S. Long, manager of the great Weyerhauser lumber interests, who had been placed on a spruce production committee created by the Aircraft Board, had several large contracts with the Government.

Explaining that in order to get out the spruce it is necessary to cut billions of feet of other lumber, Major Sligh said that the great lumber interests were not willing to do this because it would create a surplus of lumber and thereby cheapen the price. He bitterly assailed the appointment of Mr. Long to the Spruce Committee, and asserted that Government spruce contract prices were "a wicked waste of money." He also said that Colonel E. R. Disque, head of the new Spruce Production Committee, had failed to get results," justifying my prediction that he would not," he added.

The witness declared that since Mr. Disque took charge production of spruce had fallen from 3,000,000 and 4,000,000 feet a month to 2,000,000 feet in January.

Ex-Governor Oswald West of Oregon told the committee that only 20 per cent of the spruce needed was being obtained. The aviation program, said Mr. West, called for 11,000,000 feet of spruce a month. In six months ended Dec. 31, he said, only 13,500,000 feet had been produced. He said the trouble was due to the fact that attempts were being made to run the logging business from Washington.

"Some one with authority, and with experienced lumber men as advisers, should be placed in the field," he said. "It's like taking candy from the baby—this selling of spruce to the Government," added Mr. West. "Those fellows know the lumber game, and you people here in Washington do not."

According to Mr. West, Mr. Long, a member of the Spruce Committee, had several extensive contracts with the Government, and was helping fix the price at which he should sell his lumber to the Government.

Mr. West was asked who was in charge of this part of the aviation program.

"God only knows, and He won't tell," said Mr. West. "I've been trying for a month to find out. I went to everybody from Secretary of War Baker to the elevator man and I haven't been able to find out."

Engle Co.'s Orders Cancelled

As a result of disclosures the committee will recall Howard Coffin of the Aircraft Production Board, for further examination.

Colonel Montgomery told the committee today that the contracts with the Engle Aircraft Company of Niles, Ohio, of which H. D. Baker, brother of Secretary of War Baker, was President, had been canceled on Jan. 21st last. The committee drew from Colonel Montgomery also that these contracts, three in number and amounting to $961,000 had been let in October, November and on December 28 last.

"Why was it not explained to this committee yesterday that these contracts had been canceled?" demanded Senator Hitchcock. "We knew nothing of it until we read in the papers today that they had been canceled. We asked yesterday for the contracts you had and the Engle contracts were given along with the rest."

Colonel Montgomery explained that Colonel Deeds, who was testifying yesterday, had lately been transferred from the post of head of the Equipment Division and probably had not received notice of the cancellation which had been sent by wire by Major Gen. Squier, the Chief Signal Officer.

Colonel Montgomery said he knew that Secretary Baker's brother was head of the Engle Company while the contracts were being negotiated, and that General Squier also knew it.

"I never mentioned it to the Secretary and, as far as I know, no one else did," said the witness.

"Why was it canceled?" he was asked.

"I believe it was on account of the Secretary's policy not to contract with a company with which his brother was connected," was the answer.

THE 230 H. P. BENZ AERO ENGINE

(*Continued from page* 889)

Camshafts.—The hollow camshafts each run in three plain phosphor-bronze bearings, and are arranged inside the top half of the crank chamber. The camshaft bearing bushes, which are hollow, are 53 mm. outside diameter, and are split on the camshaft axis and held together by wire rings on either side to allow the camshafts to be easily inserted in the crankcase. The bearings are located by grub screws screwed in from the outside of the crank chamber.

The camshafts are driven by gears from the intermediate gear wheel which meshes with the crankshaft distribution pinion, and arranged inside a casing formed at the rear end of the crankcase. The camshaft gears are bolted to the camshafts by drilled flanges, which provide a vernier adjustment for setting the camshafts.

Half compression cams are arranged on the exhaust camshaft in the usual manner. The laternal movement of the floating camshaft is effected by a small lever at the rear end of the bookcase, which operates a two-start square thread screw of 24 mm. pitch. The camshaft is returned to is normal running position by a spring arranged inside the front end of the hollow camshaft. Further details of this half compression gear are shown in Fig. 11.

The half compression cams open the exhaust valves at 35° E., and close at 22° L.

Crankcase.—The details of the crankcase are clearly shown in the photographic views of the top and bottom halves (Figs. 13 and 14).

The method of cooling the interior of the crank chamber and sump indicates the fact that this matter has received most careful consideration in design. In the top half of the crankcase six of the seven main bearing houses are cast so that the webs form air passages transversely across the engine. Two of these passages form the air intake passages for the two carburettors—similarly to those of the 160 h.p. Benz engines—as already stated. A section through one of these passages is shown in Fig. 16.

The bottom half of the crank chamber is extended to form an oil sump and is of unusual design. The lower portion is cooled by 18 30-mm. aluminum tubes fixed transversely across the base chamber, the air being scooped into the cooling tubes by a large sheet aluminum louvred cowl on the induction side of the engine. A corresponding but reversed cowl is fitted on the exhaust side.

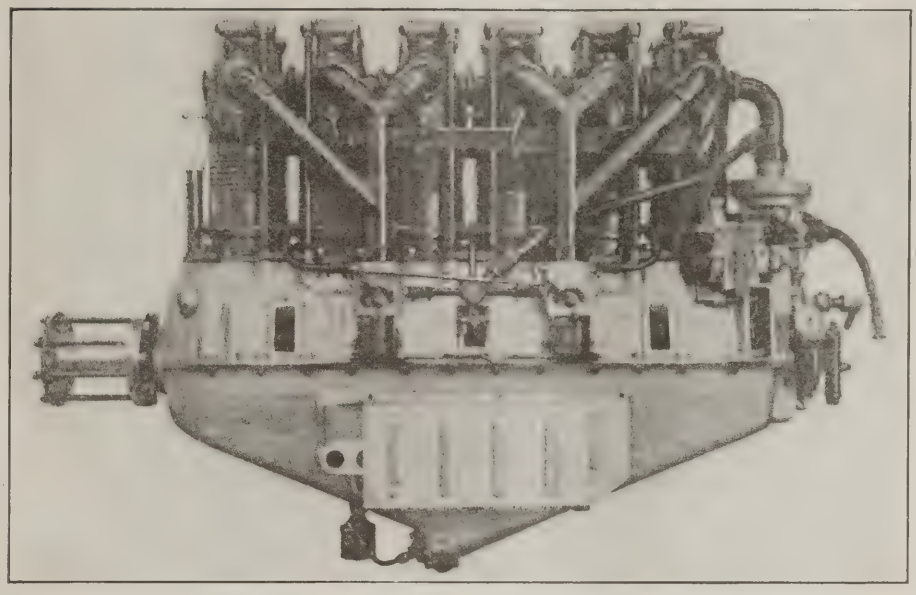


Fig. 2.—Inlet side of the 230 H. P. Benz engine

Breathers are also fitted into the top half of the crank chamber. The simple type of wire spring clip fitted to the breathers should be noted.

Carburation system.—Two separate carburettors are fitted, each feeding three cylinders. These are attached by flanges to the side of the top half of the crank chamber.

Referring to the sectional drawing of the carburettor (Fig. 16) it will be seen that the pilot jet is formed by an extension of the brass tube into which the main jet is screwed.

This combined jet is screwed obliquely into the bottom of the float chamber casting and not into the body of the carburettor. The float chamber is attached to the body of the carburettor by two bolts, and the throttle is of the horizontal barrel type.

As already mentioned, the main air intake passages are cast in the crank chamber between the webs of the main bearings, air entering each carburettor through two ports cut in the end of the throttle, and also through the air passage at the base of the carburettor below the jets.

At full throttle most of the air is taken through the air ports in the throttle above the jets. When the throttle is closed for slow running the main jet is completely cut off, and all the air is taken through the passage containing the pilot jet. The slow running of the engine is very good.

The air intake ports in the end of the throttle are so designed that the petrol air ratio remains practically constant over a wide range of throttle opening up to nearly half throttle; the last movement of the throttle, however, causes no increase in petrol flow, but, on the contrary, a slight decrease. No compensating arrangement is fitted for high altitude control. The body of the carburettor around the throttle is water-jacketed, and is connected by an arrangement of steel piping to the delivery of the water pump, and also to the lower water connections at the bottom of the water jackets between each pair of cylinders. The arrangement is clearly shown in the side view of the engine (Fig. 1).

The design of the branched induction pipes is interesting. These are built up of aluminum tubes with cast aluminum bends, and weigh only 2.625 lbs. each complete with connections. The internal diameter of the induction pipe equals 58 mm.

The attached R. A. F. test report computes the petrol consumption at 150 pints per hour, equaling 0.65 pint per brake horsepower hour.

The connections between the flanged bends of the induction pipes and the cylinders, and also between the bottom ends of the induction pipes and the carburettors are made with rubber ring joints secured by wide band clips as shown in Fig. 1.

These joints, when loosened, being more or less flexible, allow any one of the cylinders to be removed without disturbing

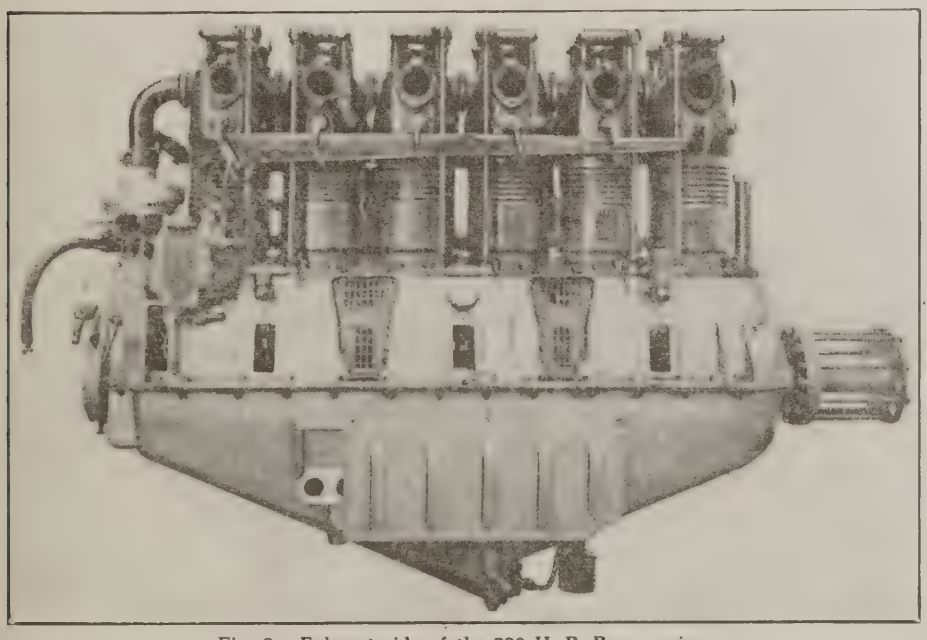


Fig. 3.—Exhaust side of the 230 H. P. Benz engine

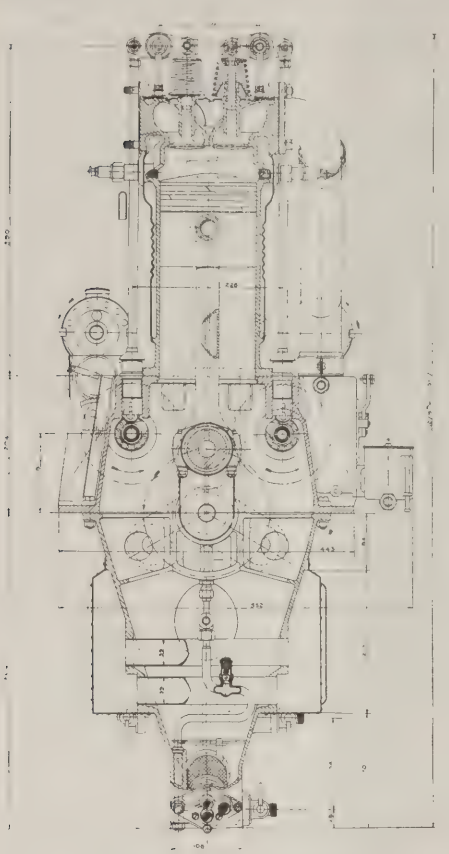


Fig. 5.—Cross section, showing general arrangement

the other joints of the induction branched pipes.

Lubrication.—Pressure feed lubrication to the crankshaft and connecting-rod bearings is efficiently carried out by an exceptionally small high-speed gear pump working submerged in the reservoir formed in the bottom of the sump. The oil pump is virtually a triple gear pump with three functions. Details of this oil pump are shown in the sectional drawings (Fig. 17), and in the photograph of the parts (Figs. 18 and 19).

The oil pump works diagonally in the sump, and is driven by a long shaft and gear wheel which meshes obliquely with the distribution pinion on the rear end of the crankshaft.

The functions of the triple oil pumps are as follows:

Oil is drawn by the main pressure pump *A* (Fig. 17) from the reservoir in the sump through the holes in the end cover of the pump, lubrating the main bearings through the main oil pipe and the small branch pipes and hollow crankshaft, thence to the gudgeon pin bearings through the small pipes inside the tubular connecting-rods. The surplus oil is thrown out from the hollow cranks on to the camshafts, etc., and returns by gravity to the sump, flowing over the air-cooling pipes in the base. The fresh oil is fed into the sump reservoir by the small suction pump *B* from the oil tank, whilst the correct working oil level is maintained in the reservoir by the gear pump *C*, the oil being drawn off through the bent pipe *E*, and returned to the oil tank. The fresh oil from the oil tank passes through a cylindrical gauze filter, which is attached to the under side of the crank chamber.

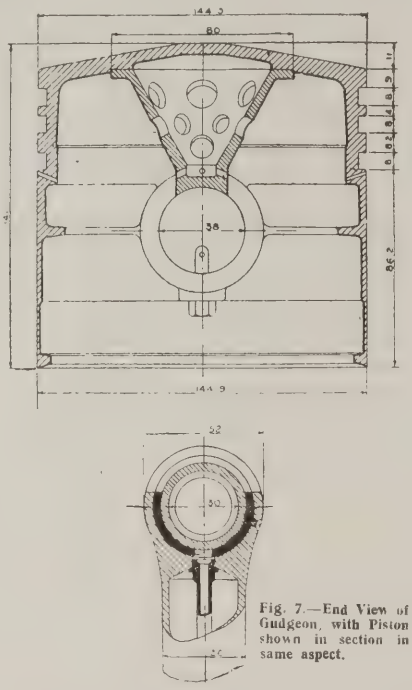


Fig. 7.—End View of Gudgeon, with Piston shown in section in same aspect.

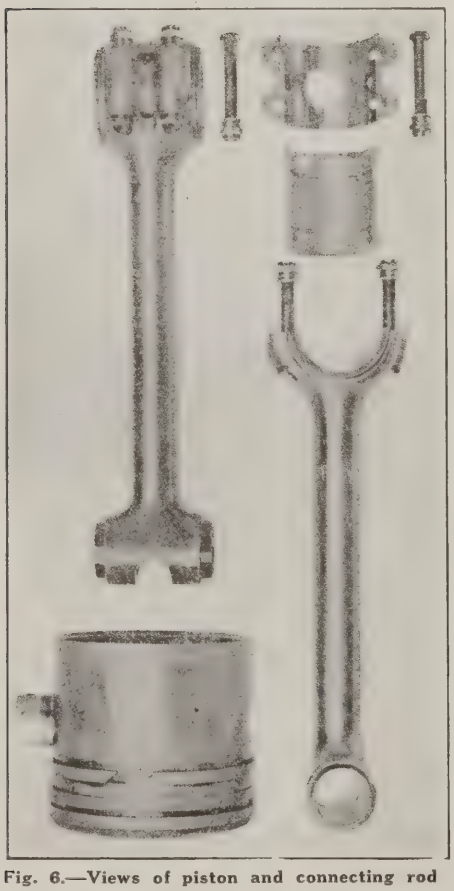


Fig. 6.—Views of piston and connecting rod

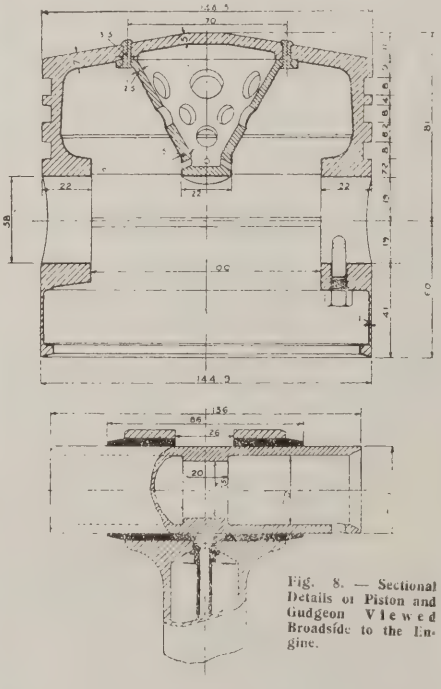


Fig. 8. — Sectional Details of Piston and Gudgeon Viewed Broadside to the Engine.

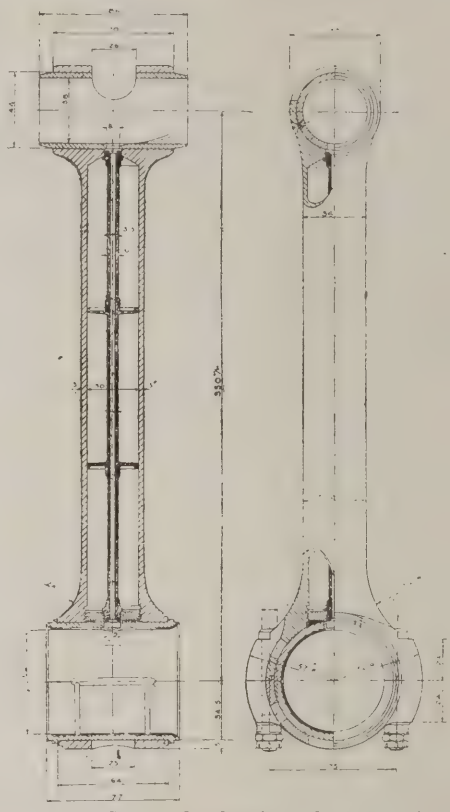


Fig. 9.—Sectional details of connecting rod

The complete oil pump with its filter is easily detachable from the sump by the studs through the flange. A small spring loaded ball is used as an oil pressure-release valve in the main oil supply pipe.

The gears of the oil pump and also the pump body are of cast iron, and the weight of the complete pump equals 2.89 lbs.

Oil consumption during R. A. F. test is stated to be 4.5 pints per hour, equaling 0.02 pint per b.h.p.

Oil pressure equals 50 lbs. maximum, 28 lbs. normal.

Ignition.—Two Z.H.6 magnetos are mounted on brackets at the rear end of the crank case, and are driven directly off the camshaft gear wheels. The design of this magneto drive is very neatly carried out and is clearly shown in the rear end view of the engine (Fig. 3). The contact breakers of the magetos are advanced or retarded by small toothed quadrants

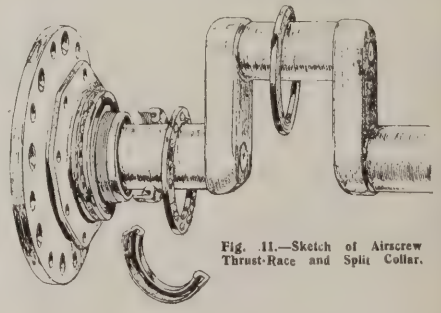


Fig. 11.—Sketch of Airscrew Thrust-Race and Split Collar.

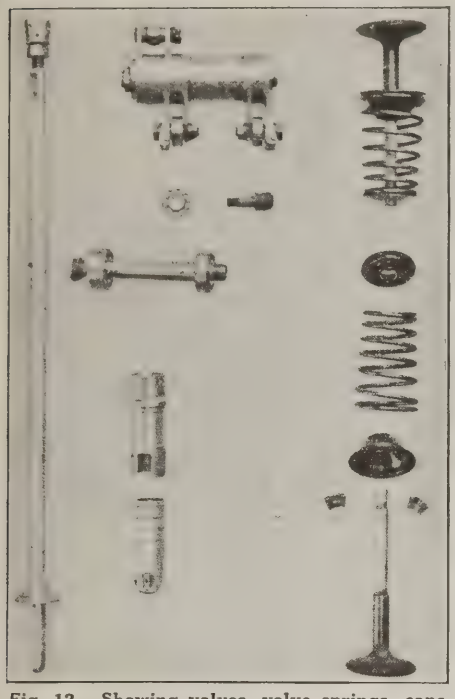


Fig. 12.—Showing valves, valve springs, caps and cotters; rocker and rocker rollers, with ball races; rocker spindle and bearings; push rod, tappet and tappet guide

which mesh with teeth cut in the underside of the cam box, and the interconnected levers of the timing advance quadrants are coupled by a rod which passes through the end of the crank case casting.

Two sparking plugs are fitted to each cylinder, one on each side, and the H.T. wires are carried in a sheet aluminum casing attached to the cylinders.

The ignition is timed as 30° E. fully advanced, equaling 18 mm. on stroke.

Power throttle and consumption curves are shown in Fig. 28. The engine was run up to 1,700 r.p.m., the peak of the power curve occurring at 1,650 r.p.m., at which 250 h.p. was developed. The maximum brake m.e.p. reached 119 lbs. per square inch at 1,100 r.p.m. The results of a one-hour test run were as follows: R.P.M., 1,400; B.H.P., 229; petrol consumption, 150 pints; oil consumption, 4.5 pints; water inlet temperature (average), 62° C.; water outlet temperature (average), 71° C.; oil temperature (max.), 50° C. steady; oil pressure (min.), 28 lbs sq. in. steady.

The curve (Fig. 29) shows inlet and exhaust valve lifts at various angles of rotation. The engine was erected on a test bed and coupled to a Heenan and Froude water dynamometer. After preliminary running, during which the exhaust manifold broke and was replaced by one from a similar engine, the attached power, throttle, and consumption curves were obtained.

230 H.P. BENZ

List of Comparative Weights of Parts and Their Percentage of Total Weight of Engine

Description of Part.	Lbs.	Per Cent. Total Weight.
Cylinders, complete, including supports for rocker levers (six at 44.25 lbs. each)	265.5	30.753
Pistons, complete, with rings and gudgeon pins (six at 7.62 lbs. each)	45.72	5.296
Connecting rods, complete (six at 7.13 lbs. each)	42.78	4.955
Valves and springs complete (twenty-four at 1.14 lbs. each)	27.36	3.169
Tappets, push rods and rocker levers (twelve sets at 3.2 lbs. each)	38.4	4.447
Induction pipes, complete (two at 2.625 lbs. each)	5.25	0.608
Carburetors, complete (two at 6.54 lbs. each)	13.08	1.515
Crank chamber, top half	103.25	11.959
Crank chamber, bottom half (including cylinder studs and oil pump shaft)	110.25	12.77
Crankshaft, complete	109.25	12.66
Propeller boss, complete	19.32	2.236
Cam-shafts, complete, with bearings less gear-wheels (two at 8.25 lbs. each)	16.5	1.912
Magnetos, complete (two at 10.75 lbs. each)	21.5	2.490
Ignition wiring, complete (two at 2.12 lbs. each)	4.24	0.491
Water pump, complete	8.75	1.013
Oil pump, complete	2.89	0.335
Petrol pump, complete	6.75	0.782
Exhaust manifold	15	1.737
Miscellaneous parts	7.53	0.872
Total weight of complete engine	863.32	100

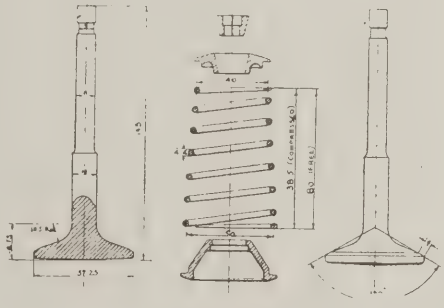


Fig. 13.—Section of valves, springs and spring caps

230 H. P. Benz Engine Data

Number and arrangement of cylinders, 6 vertical bore, 145 mm. (5.71 ins.); stroke, 190 mm. (7.48 ins.); stroke/bore ratio, 1.31 : 1.

Stroke volume of one cylinder, 3,137.476 cu. cms. (191.386 cu. ins.); total stroke volume of engine, 18,824.856 cu. cms. (1,148.316 cu. ins.).

Area of one piston, 165.13 sq. cms. (25.59 sq. ins.); total piston area of engine, 990.78 sq. cm. (153.57 sq. ins.).

Clearance volume of one cylinder, 796 cu. cms. (48.66 cu. ins.); compression ratio, 4.91 : 1.

Normal b.h.p. and speed, 230 b.h.p. at 1,400 r.p.m.; piston speed, 1,744 ft. per min.; brake mean effective pressure, 113 lbs. per sq. inch at 1,400 r.p.m; 119 lbs. per sq. inch at 1,100 r.p.m.; cu. ins. of stroke volume per b.h.p., 4.99; sq. ins. of piston area per b.h.p., .667; h.p. per cu. ft. of stroke volume, 346.3 h.p.; h.p. per sq. ft. of piston area, 215.9 h.p.

Direction of rotation of crank, r.h.t.; direction of rotation of propeller, r.h.t.; normal speed of propeller, engine speed.

Lubrication system, forced to main bearings from reservoir in sump; brand of oil, 50 per cent vacuum heavy and 50 per cent sternol; oil pressure, 28 lbs. normal; 50 lbs. max.; temperature, 50° C., max.; consumption per hour, 4.5 pints; consumption per b.h.p. hour, .02 pints; specific gravity of oil, .9.

Carburettor type, 2 Benz, each feeding 3 cylinders (2 jet); mixture control, automatic; fuel consumption per hour, 150

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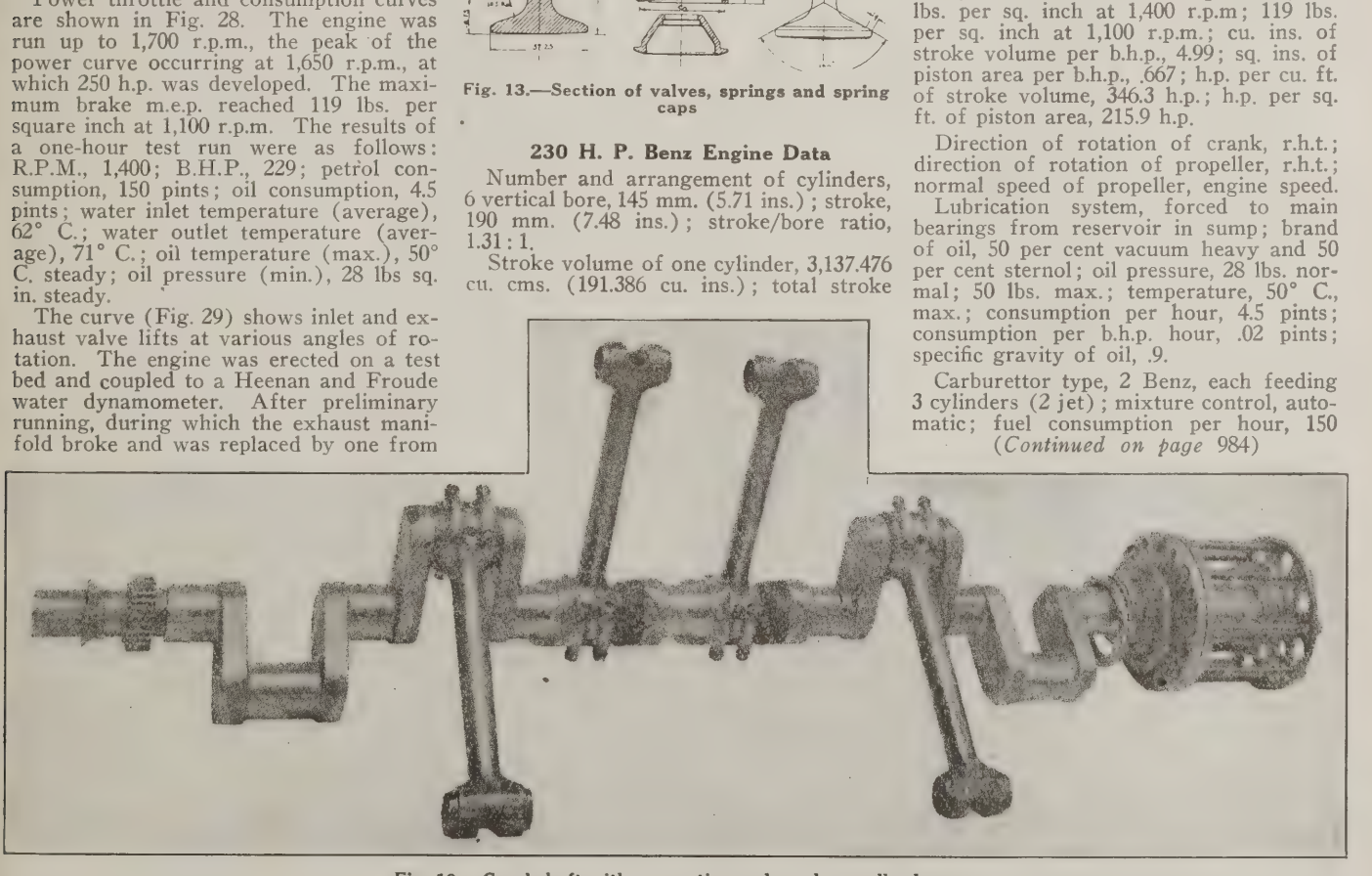
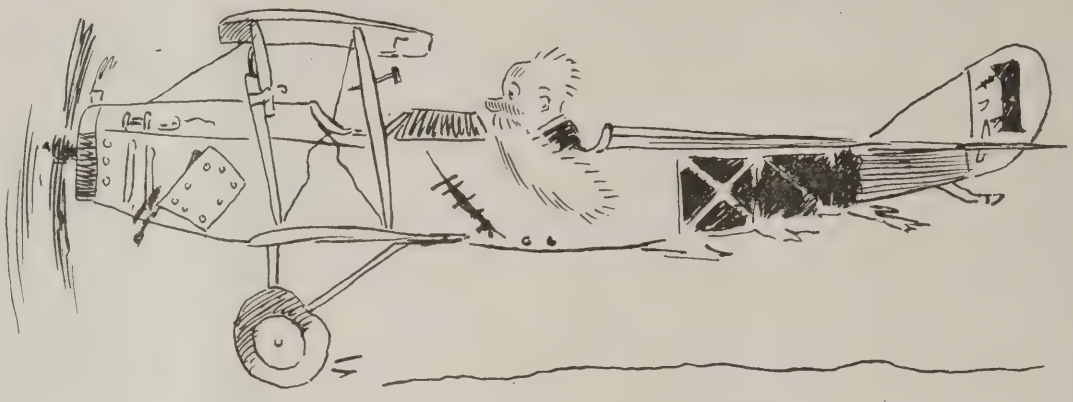


Fig. 14.—Top of cylinder showing general arrangement of the valve gear

Fig. 10.—Crankshaft with connecting rods and propeller boss



.AD INFINITUM

Unless we do something to Oslerize aerial jitneys, we'll have the classic air-lanes disgraced by rusty twenty-five-year-old rigs, driven by bewhiskered and persistent old gents who will insist on driving along the classic lanes. Let's do something before this nuisance goes too far!

AEROPLANE LONGEVITY!

By E. H. BALLARD, Manager, Curtiss Flying Schools

A TRUSTY old rig, the familiar flying boat type, descended out of the dusk one evening a couple of months ago at Newport News, and by its tarnished, scarred number-plate did we know it! I patted its oil-stained mahogany sides and greeted it as an old and true acquaintance. That boat was built at Hammondsport in the winter of 1915 and used during the ensuing summer by the Curtiss School at Buffalo. At the close of the season's training there it was purchased by a student and shipped to the east coast of Florida for winter flying. Due to faulty assemblying adjustments, it unfortunately suffered a considerable smash-up while making a landing; but for a remarkably small sum the hull was repaired by a local boat woodworker and with the replacing of a wing panel or two, was sold to Professor Hiram Bingham, of Yale University, then in training on boat flying at Miami. Professor Bingham, by the way, is now Lieutenant-Colonel Bingham, of the Aviation Section. Probably some of the hard-working students at the Ground Schools wish the Colonel had remained the Professor, and stuck to flying. He is the framer of the eight-weeks course of study and drill which the Section's fledglings must do battle with before reporting at the Flying Fields to try their wings.

At the time Colonel Bingham left Miami for Washington the Third Aero Coast Patrol Unit, composed of thirty-five energetically patriotic young men, were in training at West Palm Beach, paying for all their machines, equipment and instructors' and mechanics' salaries out of their own pockets. They purchased the Colonel's boat and used it for several months in their work there. Upon the weather becoming more favorable for flying in the North, the boat was brought up and used at Mastic, Long Island, during the summer. When the unit there was transferred into the U. S. Naval Reserve Corps, the boat was purchased by M. B. Sulzberger, a member of the unit, and some time later was headed for Newport News, Va.

On November 3d, accompanied by John A. Laird, now one of the Naval Reserve Corps flyers at the Great Lakes Training Station, the two set off along the coast. With the doubtful aid of a rickety little whirligig compass, and having made no arrangements for the trip, carrying no maps or special equipment, they were certainly flying as the pigeons. A stop was made at Atlantic City and Ocean City, Maryland, to replenish fuel tanks and hamper supplies. Shortly after leaving the latter place they ran into a heavy fog, and thanks to their agitated—and agitating—compass, soon lost their way. Nearly one hundred miles of extra flying was the result of this misfortune, bringing the total distance of the trip to nearly six hundred miles. Some good strong kick, I should say, for a craft which had seen the service of turning out numerous student aviators. A green student, you know, will buffet the poor water pretty rough on *some* landings. There are many more kicks left in her, too. She was up against it hard, though, the other day.

On December 31st the contest for 1917 for the Curtiss Marine Flying Trophy closed. Mr. Sulzberger had been in Virginia for a week or so waiting a let-up in the unprecedented cold snap there. His intention was to pile up the greatest mileage within ten consecutive hours' flying for that year, and thus solder on another leg of the trophy for the Aero Club of America, for which he was to fly. I wouldn't like to say how cold it was on December 31st there, as some member of the advertising committee of the Newport News Chamber of Commerce might feel hurt. In any event, the radiator and water pipes of the boat's motor didn't get real warm until noon of that last day.

With A. R. Gaurm as a passenger and both hidden in about seven suits of clothes, Sulzberger and his reluctant boat were pushed into the icy waters of Hampton Roads—exactly where the Monitor and the Merrimac held their warmer affair some little time ago. The plane took to the air all right—and then the fun began. No sooner did she leave the water than the keen cold air would freeze the spray upon the control wires and pulleys. Fortunately, the flipper wires have no exposed pulleys to become ice-locked, so Sulzberger landed safely—and thankfully. Three times they chipped away the ice films, but each time they arose from the water the wheels on the control column instantly became immovable.

I wondered how Dr. Guarm was enjoying striking that air at a sixty-mile clip. He had just returned to this country to obtain enlistment in the Aviation Section, after a three-year stay—in Paraguay!

But here is 1918 to figure on—and it wouldn't surprise me one bit if that good old ark showed her trailing-edge to many another aspirant for that Greatest Mileage Record. Which all goes to say that Osler is right—*occasionally*.

(*Continued from page* 983)

pints fuel consumption per b.h.p. hour, .65 pint; specific gravity of fuel, .720.

Magneto type, 2 Bosch Z.h. 6; firing sequence of engine, prop: 1-5-3-6-2-4; numbering of cylinders, prop: 1-2-3-4-5-6; speed of magneto, two-thirds engine speed; direction of rotation of magneto, facing driving end of armature, anti-clockwise; magneto timing, 30° . 18 mm. on stroke.

Inlet valve opens, deg. on crank, 10° E., inlet valve closes, deg. on crank, 55° L.; maximum lift of inlet valve = h, 11.8 mm. (.465 in.); diameter of inlet valve = (smallest dia.), two of 52 mm.; area of inlet valve ports = $\pi \times d \times h$, 19.27 sq. cm. each; mean gas velocity through inlet valve, 124 ft. per sec.; clearance of inlet tappet, .009 in.

Exhaust valve opens, deg. on crank, 60° E.; exhaust valve closes, deg. on crank, 20° L.; maximum lift of exhaust valve = h, 11.25 mm. (.443 in.); diameter of exhaust valve ports = d (smallest diam.), two of 52 mm. dia.; area of exhaust valve ports = $\pi \times d \times h$, 18.37 sq. cms. (each) = 2.84 sq. ins.; clearance of exhaust tappet, .015 in.; direction of rotation of revolution counter drive, facing driving shaft on engine, anti-clockwise; speed of revolution counter drive, ½ E. S.

Weight engine complete with propeller hub, less water, fuel and oil and exhaust manifold, 848.32 lbs.; weight per b.h.p., ditto, 3.68 lbs.; weight of exhaust manifold, 15 lbs.; weight of oil carried in engine, 18 lbs.; jacket capacity of one cylinder, 1,873 c.c.; weight of water carried in engine, 30.9 lbs.; weight of radiators, less water, 136 lbs.; weight of fuel per hour, 135 lbs.; weight of oil per hour, 5.06 lbs.; total weight of fuel and oil per hour, 140.06 lbs.

Gross weight of engine in running order, less fuel and oil, cooling system at .65 lb. per b.h.p., 996 lbs., weight per b.h.p., ditto, 433 lbs.

Gross weight of engine in running order with fuel and oil for six hours (tankage reckoned at 10 per cent weight of fuel and oil), 1,920.89 lbs.; weight per b.h.p. with fuel and oil for six hours, 8.35 lbs.

FOREIGN NEWS

FRANCE

Greatly increased bombing activity is indicated by the French announcement issued on January 29th, which reads as follows:

"On Sunday, January 27th, one German aeroplane was brought down and three others fell damaged within the enemy lines. On the same day French squadrons threw down 6,000 kilograms (13,200 pounds) of explosives on the railway station at Conflans, factories in the region of St. Frivas and various aviation grounds in the enemy zones."

Successful bombing attacks and victorious combats marked the operations of January 30th, described in the announcement of the 31st as follows:

"On Tuesday, January 29th, a French squadron, including Captain Guillemin and Sub-lieutenant Lanoreux, bombarded from a very low altitude the railway station at Thiaucourt, where a large fire was observed.

"On January 30 a German aeroplane was brought down by our pilots. Three others fell inside their own lines."

On the Balkan front Allied aviators have continued their persistent bombardment of places of military importance. The French statement of January 29th describes the aeronautic operations as follows:

"Artillery actions occurred at the Cerna bend and north of Monastir. The Allied aviators were very active, carrying out numerous bombardments north of Monastir, in the Vardar Valley and in the region of Lake Doiran. One German machine was brought down."

In the report of January 29th, concerning the operations on the Balkan front, it is announced that allied aviators bombed enemy establishments in the valley of the Vardar and in the region of Seres, and a supplementary announcement reports bombing raids in the region of Drama and the Vardar Valley.

As anticipated, an air raid over Paris was conducted on the night of January 30th, which resulted in the death of twenty persons and fifty injured. The raid is officially described as follows:

"First information indicates that four enemy squadrons crossed the lines north of Compeigne, proceeding toward Paris. Thanks to the extreme clearness of the atmosphere, the machines were able to remain at a very high altitude. They approached from the north and northeast, and threw projectiles over several Paris suburbs. Then they flew over Paris, keeping for the most part to the right bank of the river and dropped almost all their bombs in a few minutes.

"Several bombs failed to explode, but others found victims, chiefly women and children. Two hospitals were struck. Several buildings were burned or seriously damaged.

"Some thirty French aeroplanes went to meet the enemy as soon as the alarm was given. Several combats occurred to the north, in which one German machine was downed. The aviators were made prisoners. One French machine, in attempting to make a landing in Paris on account of motor trouble, fell. The pilot and gunner were wounded."

GERMANY

The favorable conditions on January 28th led to very active aircraft operations on the western and southern fronts described as follows:

"Lively flying activity led to numerous duels in the air. We brought down yesterday thirteen enemy aeroplanes and one captive balloon.

"Bombs were dropped on London and Sheerness with good effect. French aviators continue their attacks on our hospitals. Several times during December they dropped bombs on hospital buildings at Bethel, and in the last few days they attacked buildings at Labry, east of Conflans."

Reporting on operations on the Italian front, the announcement states: "One of our bombing squadrons on Saturday night dropped about twenty-one tons of bombs on Castelfranco, Treviso and Mestre with good effect. Big fires were seen from a long distance."

The German official communication issued on January 31st reports the raid on London and several aerial combats, as follows:

"Our aviators made successful attacks on England and the north coast of France. Bombs were dropped on London, Southend, Dunkirk, Gravelines and Calais.

"Eight enemy aeroplanes and two captive balloons were brought down in aerial fighting yesterday."

An official announcement was issued regarding the raid on Paris, which resulted in the loss of twenty lives. Continued raids are promised for the future. The announcement is as follows:

"On Christmas eve and during January enemy aviators, in spite of our warning, again dropped bombs on open German towns outside the region of operations. Thanks to our measures of defence the losses and damage were slight.

"As a reprisal fourteen tons of bombs were dropped last night on the city of Paris in our first systematic attack from the air."

GREAT BRITAIN

With the coming of more favorable conditions for the conduct of aerial operations, extensive bombing raids and successful combats are recorded in the announcement issued on January 26th, reporting activity for the two days preceding:

"More than 300 bombs were dropped on the Courtari, Ledgehem and Douai railway stations, the aerodrom near Courtrai and on German billets west of Cambrai. The enemy's hangars at Douai and other ground targets were bombarded by aeroplanes.

"Seven hostile machines were brought down fighting and five others were driven out of control. Two British machines are missing. As soon as it was dark British night flyers bombed a German aerodrome northeast of Ghent and other aerodromes near Courtrai and billets around Roulers.

"All of the machines returned. At the same time other machines raided several objectives in Germany, making direct hits on factories, docks and in the town of Mannheim.

"The barracks and railway station at Treves, the steel works at Thionville and the railway stations at Saarbrucken and Oberbillig also were attacked with excellent results. The pilots report large explosions at all objectives and a big fire at Treves. One of our machines failed to return."

Extensive aerial operations consisting of numerous bombing attacks are reported on January 30th, as follows:

"Good visibility Monday enabled much aviation work in conjunction with the artillery, and also some photography, to be carried out. British airmen dropped 400 bombs on various objectives, including Roulers, Menin and the aerodrome near Tournai. Several thousand rounds were fired at enemy troops from machines in the air. In the fighting throughout the day two hostile machines were shot down and six were brought down out of control. Three of our machines are missing.

"During the night of Monday-Tuesday six tons of bombs were dropped on enemy billets, railway stations and trains and aerodromes. All the British machines returned safely.

"Last night one of our patrols successfully attacked a German post northeast of Havrincourt and killed or took prisoner a number of the enemy's garrison. Further casualties were inflicted on the enemy in patrol encounters in the neighborhood of Bullecourt, where we captured a machine gun."

Another announcement on aviation was issued on January 20th, as follows:

"Bombing attacks were carried out Tuesday vigorously against ammunition dumps and aerodromes all day long, while low-flying machines engaged the enemy's troops with machine-gun fire.

"Eight hostile machines were downed in air fighting, and four were driven down out of control. An observation balloon was downed in flames. Three of our machines are missing."

On the Balkan front, on January 30th, the British brought down an enemy aeroplane near Doiran.

According to dispatches dated January 26th, the Royal Naval Air Service bombed a German aerodrome at Varssenaere on January 25th, with the result that direct hits were obtained. All the machines returned safely.

In patrol fighting on the preceding day, the admiralty announced that two enemy aircraft were destroyed and two were shot down out of control. One British machine is missing.

On January 28th German aeroplanes made their first attack of the year upon London and its suburbs, their bombs inflicting casualties officially reported as 47 killed and 169 injured. All the victims, except one of the killed and seven of the injured were in the London aera itself. No serious material damage was done, and the raiders suffered the loss of one machine, which fell in flames from a height of 10,000 feet, its three occupants being burned to death.

The official announcement of the raid follows:

"The latest information shows that two group of raiders crossed the Essex coast and one group the Kent coast, practically simultaneously, at about 8 P. M. The two former detachments proceeded toward London on parallel courses across Essex. The capital was approached from the east and northeast shortly after 9.

"Of the machines which crossed the Kent coast, two dropped bombs in the Isles of Thanet and Sheppey. The remainder, crossing the Thames estuary, also approached East London through Essex.

"Apparently about fifteen machines took part in these attacks, of which four or five reached the capital and dropped bombs in various districts between 9 and 10 P. M.

"Some time after the first attack had terminated other enemy aeroplanes crossed the Essex coast. Only one of these reached London, which entered from the north, bombs being dropped between 12:15 and 12:30 A. M.

"A number of machines of the Royal Flying Corps went up. Two of our scouts encountered an enemy aeroplane over Essex. After a brief fight at close range, the raider took fire and fell in flames to the ground, 10,000 feet below. All three of its crew were burned to death.

"Several other engagements with enemy machines were reported by our pilot, one of whom pursued a raider across the coast and fought an indecisive engagement over the sea. All our pilots returned safely."

Fifteen German aircraft took part in a new raid on London the night of January 29th, which resulted in three deaths and ten injured. The official announcement follows:

"A number of attacks were delivered against London by hostile aeroplanes last night, between 10 P. M. and 12:30 A. M., but in no case did the raiders penetrate into the capital. The first enemy machines crossed the Isle of Thanet at 9:30 P. M., and proceeded up the Thames estuary toward London, but were all turned back by gunfire. At about the same time three or four raiders crossed the Essex coast. These also failed to penetrate the outer defenses of the capital.

"Meanwhile a single aeroplane which crossed the Essex coast at 10:30 P. M., passed around the north and west of London, and dropped some bombs on the southwestern outskirts. At the same time another enemy machine dropped bombs on the northeastern outskirts, without causing any casualties or damage.

"Other aeroplanes which crossed the Kent and Essex coast between 10:25 P. M. and 10:50 P. M., were all turned back by gunfire at various places on the way to London.

"The final attack, delivered across Essex by three or four machines, between 11:30 P. M. and midnight, was equally unsuccessful. Bombs were dropped in various places in Kent and Essex.

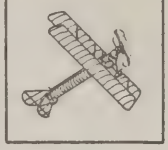
"About the same number of machine as on the previous night appears to have participated in the raid, viz., fifteen. A number of our aeroplanes went up. Several engagements with enemy machines are reported. One of our pilots attacked a raider over the northeastern outskirts of London, with the result that it dropped its bombs on open ground and made off. All our pilots returned safely."

The enemy raiders during the last two raids did not succeed, and apparently did not attempt, to bomb any military objectives. They merely attempted to kill civilians and a majority of the victims, as usual, were women and children.

ITALY

The effectiveness of Italian anti-aircraft gunnery is indicated by the report issued on January 25th, which follows:

"There has been considerable hostile aerial activity from the Adige to the Brenta and along the Piave, but the machines were kept from our front lines by bursts of machine gun fire."



MODEL NEWS

Edited by G. A. Cavanagh



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.

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NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

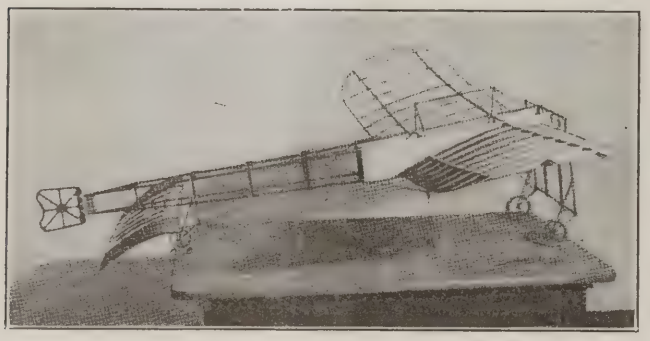
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.



An example of exquisite workmanship and fidelity to the most minute detail

Some Mechanical Details of Model Aeroplane Construction

By Thomas Stanley Curtis

Infinite patience, persistent training of the muscles of the hands, the eye of an artist, and, above all, an inborn feeling or, if you will, frame of mind calling incessantly for absolute fidelity to detail—all of these and more must be the characteristics of the successful worker in miniature.

The beautiful little model which I have chosen as an illustration of the points to be brought out in this article is the work of J. E. Carrington, Jr., one of the Directors of the A. S. E. E. and a model engineer by vocation since the days when he coasted down the hill on his first barrel-stave bobsled. The pictorial evidence on this and the pages which follow is sufficient to show the extent to which Carrington has carried his training; what he has done, others can do.

Perhaps the casual reader will question "Is the game worth the candle?" Emphatically, I believe it is. Such work may be considered rather more than a hobby; it is a liberal education in machine design, precision tool working and the development of the artistic sense; it develops an intimate working knowledge of machines, instruments, and devices which represent the latest and greatest achievements of science. The pursuit of the hobby, if such we may call it, educates its devotee while it entertains him.

A model such as the one under consideration has great possibilities as a practical aid in the insertion of students who may later become mechanics, pilots or salesmen. The application of engineering models is spreading rapidly in this direction and a very promising field of endeavor is opening to model engineers of brains and ability, as we have reiterated again and again in this magazine.

A few days before this was written, I showed the photographs of the little aeroplane to a young man who has built a great many flying models. His first remark showed me why I should answer the question propounded in the third paragraph. The builder of flying models seems to have a particularly well developed aversion to anything that represents finished workmanship and fidelity to a large prototype in design and detail.

While it is true that, in the amateur aviation meets, the crudest and clumsiest machines nearly always carry away the ribbon, I still maintain that such machines are but an introduction to the art, serving to arouse the interest of the recruit and urging him on to greater achievements as his skill and knowledge of principles increases. It seems to me that the reason why the crude makeshifts work so well is not, as many builders believe, due to any inherent merit in mediocre design and workmanship, but, rather, to the fact that the absence of refinement and detail means a corresponding elimination of weight.

I do not contend that Mr. Carrington's model will fly any better, or indeed nearly as well, as one represented by two bits of paper pasted to a pair of sticks. I am merely defending the practice of real model engineering and trying to show how a model aeroplane that may never leave the ground has just as important a place to fill as the amazingly crude but effective little planes that boast of little other than a propeller, rubber band, and a pair of wings. Each has its sphere, but it seems to me the engineering model takes the laurels when it comes to the greatest good to the greatest number.

In line with this reasoning, witness the remarkable data compiled as the result of scientifically designed and built models suspended in glass wind tunnels through which smoke-laden air is blown. To this device we owe much of our real knowledge of the art as, through its graphic aid, we have been shown just what takes place as the aeroplane travels through the air. It has shown us, to a certain degree, how the bird soars, the effect of pressure above and below the wing, what happens when the wings of a biplane are too close together, and countless other details of the most profound importance.

It is to be regretted that Mr. Carrington's little machine is of an obsolete type. Our illustration would have been more to the point if it were modern, but in the five years which have elapsed since the 'plane was built, startling changes have taken place and the model today is interesting solely as an example of exquisite workmanship and perhaps as a means of suggesting the construction of many details which might well be applied to a modern type.

In selecting his materials, the builder spared no pains to procure the very best of everything. His lumber for the framing of the fuselage was seasoned for years before he bought it. Piece after piece was rejected before the four straight, perfect timbers were found.

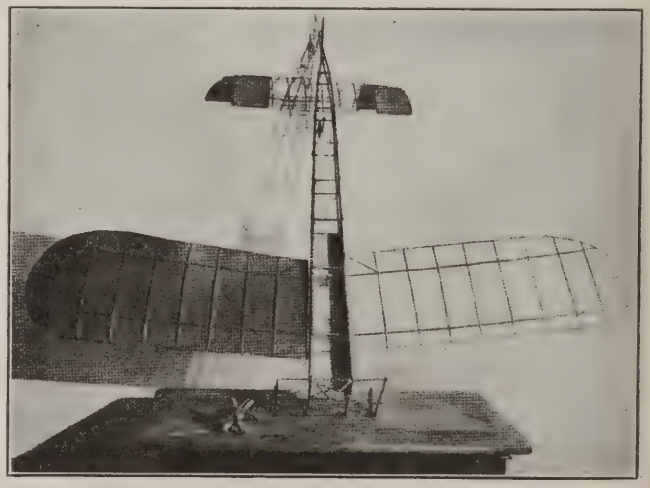
In building the metal fixtures and accessories, the drill size ran from No. 24 to 60; the taps and dies were little larger than a good-sized sewing needle. Every little turnbuckle represents the utmost delicacy of workmanship, the average length, as the reader will note from the pictures, being less than that of a man's finger nail. Still, with all this diminutive mechanism, every turnbuckle, every wheel, lever, and cable, works with ease and efficiency just as in the man-carrying prototype.

The tiny studs and bolts are fitted with hexagon nuts a scant three thirty-seconds of an inch in diameter. They had to be made by drilling, tapping and cutting off hexagon brass rod in the lathe. Every eye-bolt is bent up from brass wire, the loop and washer soldered, and the stem threaded for the tiny hexagonal nut.

As was the custom at the time when the model was built, the warping of the wing tips was accomplished by tilting the steering wheel, and by turning the latter the rudder was controlled. The cables governing these operations pass through tiny pulley blocks secured in the regulation manner to the frame of the fuselage.

The landing gear is a marvel of workmanship. The spring suspension actually works as a shock absorber, the coiled springs being compressed as the wheels respond to the shock of landing.

The rib or aerofoil construction deserves special comment. The ribs proper are made of sheet aluminum, .007 in. thick and formed in a die which was made from a length of old fencing foil, heated and bent to the desired curvature, and seating in a recessed piece of hard wood carved and burned out to the correct shape. The edge of the wing is bound with the same grade of aluminum bent double and crimped over the ends of the ribs.



Below: Looking down upon the little aeroplane; a tiny six-cylinder steam engine may be seen on the table beside it

(*To be continued*)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

THE EQUIPMENT OFFICER'S LAMENT

By G. R. S. of R. F. C.

I failed to pass my pilot's test,
  I could not mount the steed that soars,
And so, ignoring my protest,
  They put me in the Stores.

Oh, blackest day of all the years!
  On which Ambition closed her doors.
They've mixed me up with guns and gears—
  Dread demons of the Stores!

Forever fled the dear delights
  That compensated even wars.
In dreams I handle bolts and sights,
  In nightmares see the Stores!

The washers, rivets, and the nuts,
  Confront me in between my snores;
I see the thrice-accursèd struts
  That haunt me at the Stores!

But out of all the hideous throng
  I think the "spare part" nuisance scores;
I never know where they belong—
  Oh, strafe the beastly Stores!

Oh, set me in some far-off spot,
  Some lonely, unfrequented shores,
Where I forget and am forgot
  By those infernal Stores!

"The pacificist is living in the clouds."—Congressman Kahn.
"The aeroplanes will get him."—Ex-Congressman Murray Hulbert.

The Song of the Aeros

With a chugging motor and the spin of our propeller
  Away we go with a starting rise, up to the skies.
Like a mammoth bird—up in the aether.
  Gently and calmly we soar along, adding beauty to the skies.
Merrily we sail along, sail along, sail along,
  With a swirling, buzzing song.

Lightly swaying in the winds, as in a gentle breeze,
  High above the clouds, we our antics try.
Giving the crowds on mother earth a chilling freeze,
  Who in turn our safety see and shout a cheering cry.
Merrily we fly along, fly along, fly along,
  With a swirling, buzzing song.

WILLARD OTIS ALGER.

Emanuel

Oh, God is with you, venturer,
  Who rides athwart the blue!
Your fuselage is trim and safe,
  Your motor purring true.

Your linen wings are gray, and swift
  To mind the rudder-bar;
Your rushing blade cleaves through, and oh,—
  God rides with strut and spar!

MARGARET L. SEAMAN.

The Weehawken Hymn of Hate

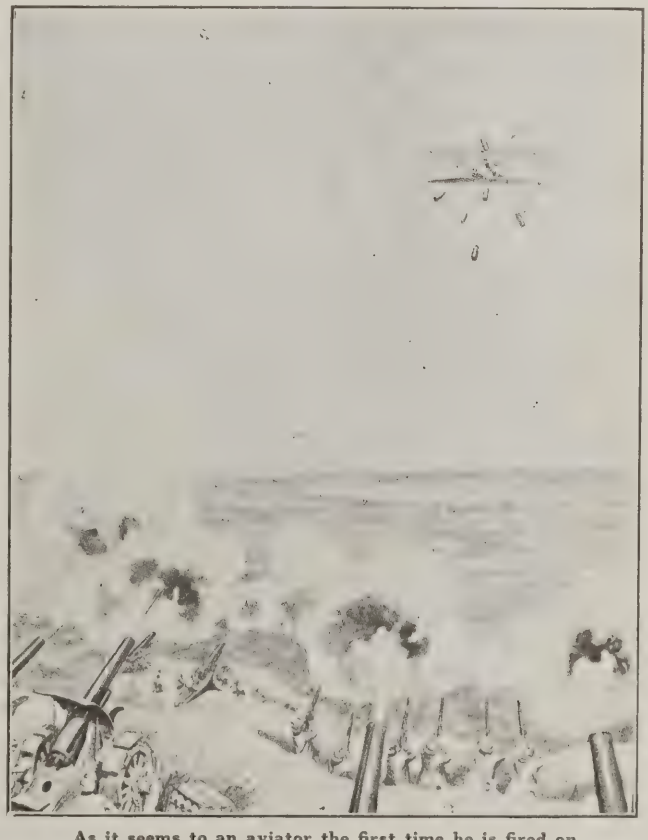
Our good friend K. M. Turner, of Aviaphone fame, sends us "The Weehawken Hymn of Hate," with the introductory lines:

"Who the author is
I do not know;
His poetry, however,
Seems to go.
If by chance
I learn his name,
We'll place it in
The Hall of Fame."

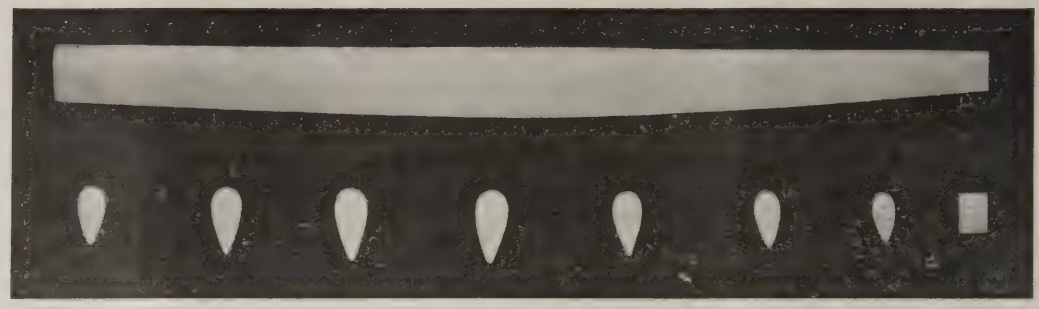
My Tuesdays are meatless,
My Wednesdays are wheatless,
I'm getting more eatless each day.
My home it is heatless,
My bed it is sheetless,
They're sent to the Y. M. C. A.
The bar-rooms are treatless,
The coffee is sweetless,
Each day I am poorer and wiser,
My stockings are feetless,
My trousers are seatless,
My God, how I hate the Kaiser.

Hardly

Early in November an aviator was captured and had been sent to jail for a year. In the tenth scene he was released from prison. I say, pop, remarked a young boy to his father, I wonder if that year went as fast for him as it did for us?



As it seems to an aviator the first time he is fired on



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ELIZABETHPORT, NEW JERSEY.

AERIAL AGE WEEKLY

Vol. 6, No. 23 FEBRUARY 18, 1918 10 CENTS A COPY



A British Hydroaeroplane with "Warren Truss Wing Bracing" in which no frame wires are required. (Illustrated London News)

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A. S. Burleson, Postmaster-General

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VOL. VI. NEW YORK, FEBRUARY 18, 1918 No. 23

AERO MAIL SERVICE SOON TO BE A REALITY

ESTABLISHMENT of an aero mail service between Washington, Philadelphia and New York during the coming summer was indicated when Postmaster Burleson called for bids on five aeroplanes for that service. It will begin with one round trip a day and later may be expanded.,

First-class mail only will be carried at the outset of the service.

The specifications call for machines which have stood satisfactory tests in the War and Navy Departments' service. The bids will be opened on February 21, and the aeroplanes are to be delivered not later than April 25. Arrangements have been made with the War Department to release a sufficient number of motors to equip the machines.

"It is not the purpose of the Post Office Department to make this an experimental service," Postmaster General Burleson announced. "Its practicability is to be assured before the establishment of the route. Once established it is to remain a permanent service."

The announcement that the Government will establish an aeroplane mail route between Washington and New York was received enthusiastically in aeronautic circles.

The Aero Club of America authorities were glad to learn of the establishing of the proposed route. Among the officials of the club who were at the club house at 297 Madison Avenue to-day were Mr. Alan R. Hawley, President of the club, who flew from New York to Washington on May 25, 1916, with Victor Carlstrom and carried a special letter to President Wilson urging the immediate training of 2,000 aviators; Henry Woodhouse, member of the Board of Governors, who has written many articles on the subject of mail and commercial transportation by aeroplane; Augustus Post, K. M. Turner and a number of Army and Navy aviators.

Mr. Hawley pointed out that the club has urged the use of aeroplanes for carrying mail for a number of years, supporting the recommendations of the Post Office, which has been asking for appropriations with which to make experiments in aerial mail carrying for many years. Mr. Hawley said:

"Had the recommendations of the Post Office been heeded three or four years ago, the war would have found us with hundreds of well-trained aerial postmen, thoroughly experienced in cross-country flying. This would have been a valuable reserve and the United States would have been in a position to supply completely trained aviators to the Allies upon our entry in the war instead of having to supply only aviation students who had had but little training."

Mr. Hawley, Mr. Woodhouse, Mr. Post and other members of the Aero Club of America were unanimous in expressing their hope that in giving advanced training to the thousands of military aviation students that are to be trained in this country which includes flying cross country, plans will be made to have the aviators carry mail over the routes which they will follow in their daily cross-country flights.

Congress has appropriated $100,000 for use in establishing aerial mail service, and the National Advisory Committee on Aeronautics and Aeronautic Experts have pronounced the service feasible and beyond experimental stages. Each aeroplane will be required to carry 300 pounds of mail a distance of not less than 200 miles without stopping, at a maximum speed with full load of 100 miles an hour, a minimum speed of 45 miles and a climbing speed of 6,000 feet in ten minutes.

A special postage rate will be charged for letters carried by aeroplane, if Congress will sanction it with the necessary law. The rate contemplated is twenty-five cents per ounce or fraction thereof.

IS THE UNITED STATES GOING TO MAKE "A SCRAP OF PAPER" OF THE CONTRACT IT MADE WITH AMERICAN AVIATORS IN FRANCE AND ITALY?

EDITOR OF THE AERIAL AGE WEEKLY,
New York City.

Dear Sir:

In the *New York Times* for February 10th there are printed side by side two articles, one from France and one from Washington.

The article from France reads as follows:

"AVIATOR CHECKED GERMAN ADVANCE.

"A stirring story of how one daring British aviator, like a guardian angel, held up for a whole day repeated enemy attacks upon a weak and crumbling British line at Cambrai in the height of the desperate struggle there by using four aeroplanes, one after another as they were torn and crippled by enemy fire, has just come to light. It shows that some of the most daring and dangerous aeroplane work of the last year has been in the new field of attacking enemy infantry from the air.

"The Germans were trying to recover a portion of the lost Hindenburg line, pushing with a great weight of men and guns at a point where it was very difficult for the British to bring up reserves. The British battalion opposing the attack had gone to earth in little isolated groups among the shell holes, grimly determined to hang on to the end.

"The German masses had already moved across No Man's Land into the battered earthworks that once formed the British firing line. Other masses were moving up in support, and already the nearest shell holes were heaving and boiling over with the restless heads and shoulders of men about to renew the advance. The barrage of the British guns was heavy, but at close quarters only infantry can stop the progress of infantry, and the fire from the British shell holes had grown weak and straggling. It looked as if the scanty British line would be overwhelmed by sheer weight of numbers.

"The fire from the Germans increased until the air was alive with their bullets. It was the concentrated fire which always precedes the rush to close quarters. The blue-gray figures were already beginning to appear above the shell holes, their loose flapping uniforms and hideous gas-masks giving them the appearance of demons, when suddenly into the smoke and murk of battle there dived a British aeroplane.

"Fifty feet from the ground it flattened out and skidded along the line, dropping its bombs among the bewildered Germans. Wheeling swiftly at the flank of the attack it came skimming back like a swallow charging a swarm of flies, its machine guns enfilading the advancing foe and driving him back to his burrows.

"A storm of German bullets swept through the planes, and a black flame-centred burst of enemy shrapnel smothered the aeroplane in vapor. The watching infantry saw splinters fall from the quivering frame, and the silvery fabric of the underwings was torn in several places by shell splinters. But the daring pilot finished his course and vanished into the smoke clouds, leaving the panic-stricken enemy clinging to his shell holes too shaken and thinned to press the attack further.

"Little by little, however, the German supports came up, advancing by short rushes over the open, reinforcing their comrades in twos and

threes, in spite of British fire. Scores and scores of their dead littered No Man's Land, but gradually the strength of the attacking line was made good, and the shell holes again began to heave and boil, as men rose from the lower cover and laid hold of the rims to assist them over the top. Then, suddenly, they were over and away, little spurts of humanity belched out of the crater field, coalescing into a seething blue-gray, rushing mass, hopelessly outweighing the handful of British defenders. But before the mass could gain full momentum, a familiar snoring hum sounded above the din of battle, and out of the low-lying haze swept the covering aeroplane, a new machine, but with the same pilot as before. His bombs dropped among the advancing Germans, dispersing those who escaped the flying fragments, and his machine guns swept them out of sight into the shell holes.

"A half hour passed, and again the enemy attempted to attack, this time hesitatingly and with diminishing spirit. Again the aeroplane appeared, and the first rattle of his gguns sent the Germans into cover again. A German aeroplane dashed down to drive him away, but another British machine from the protecting patrol came down on the German's tail and sent him cartwheeling behind his own lines. There were other German machines in the offing, but the watchful British fighters made the enemy airmen shy of losing their altitude, and the daring British pilot kept his guard over the threatened line without further interference.

"Many times he swept down on the Germans that day, crumpling up every attempted attack with his fire, rendering portions of their positions untenable with his bombs; often rocking madly in the air gusts from a barrage salvo, just as often performing wilder manœuvres to confuse the gunners and riflemen who searched for him incessantly. Three times his aeroplane was so badly damaged that he had to nurse its failing strength back to his aerodrome. But each time he returned on a new machine, encouraging the British infantry by his example, and scattering death and confusion among their foes. He was flying his fourth machine when darkness settled down, putting an end to the conflict, with the Germans securely checked."

The article from Washington reads as follows:

"AGAINST FLIERS' EXTRA PAY.

"Washington, Feb. 9.—Secretary Baker, at the request of General Pershing, sent to the Capitol today a bill to repeal the law granting extra allowances to aviators and aeronauts in Army service. In a cablegram to the Secretary of War General Pershing said:

" 'For the reason that flying duty in aviation section is no more hazardous than duty with other combat troops, and involves nothing like the hardships endured by troops which occupy trenches, repeal is recommended as early as possible of laws providing increased rank and pay for the qualification as junior military aviator, military aviator, junior military aeronaut and military aeronaut, and for any other increased pay for engaging in aerial flight.

" 'Such laws are productive of improper balance in rank and pay, and result in injustice to other arms, and are no longer necessary in order to get the personnel, as was the case when passed and aviation was in experimental stage. General Foulois is in full accord with the recommendation.'

"The bill will be introduced in the Senate early next week by Senator Chamberlain, Chairman of the Military Affairs Committee, and its prompt passage is regarded as certain."

I will ask your indulgence and the indulgence of your readers to place themselves in the position of the father or mother of two sons, whose ages range between 21 and 25, and I will ask you to be kind enough to go back with me twelve or fourteen months from date, to the time when every father and mother could not help but feel that it was their duty to do something to prepare their sons for the war, which seemed inevitable. And the sons felt even more strongly than the parents about the subject, and they chafed daily under their inability to join the aviation service, which was acknowledged to be the one branch of the service where a man could be of greater use to the country than in any other branch of the service.

President Wilson, at the urging of the Aero Club of America, had authorized the formation of the Aerial Reserve Corps in July, 1916, but somehow, the actual organization was delayed for more than six months, and in the meantime, our two boys, with hundreds of other boys, all well educated, college boys, many of whom had received their preliminary training in aviation, at their own or the Aero Club of America's expense, actually begged and pleaded to be admitted into the Aerial Reserve Corps. They went to Washington to see the authorities, the parents wrote, their friends did likewise. In every case the answer from the Signal Corps authorities was a vague statement that they were not in a position to consider applications for the Aviation Section, Signal Officers' Reserve.

Matters drifted this way for a few months, and then the United States severed relations with Germany, but even then, nothing was heard from the Signal Corps regarding the applications, and visits to the Washington authorities brought no more results than before.

At about that time it came out on the floor of Congress that the Chief Signal Officer had stated to the House Committee on Military Affairs that civilians would be of little value as aviators, and therefore, it was recommended that an appropriation for the training of National Guard Officers in aviation be not allowed.

This was stated on the floor of Congress in February, 1917, and was a knock-down blow to our two boys, as well as to the hundreds of other young men who had been waiting patiently, and impatiently, for months to get an opportunity to serve their country to the best of their ability!

One of the two boys, like many others, knowing that the fight in the air in France was being fought mainly by French, British, Canadian and American aviators who a few months ago were civilians who had never had military training, decided to go to France and join the Lafayette Corps. They went to France and they were welcomed and put under training.

The other boy waited in the United States and after a number of months was accepted by the Signal Corps, given a very brief preliminary training, mainly in the theory of aeronautics, and then was sent to Italy to continue his training there.

Some three months ago arrangements were made to take over the members of the Lafayette Escadrille and the students in the Franco-American Flying Corps whose training had been delayed greatly while arrangements were being made between the American and French authorities to turn over these American aviators and students to the American forces. While the arrangements were going on the training was almost suspended, especially as there were a greater number of American students to be trained, and the limited number of machines which were available in France were needed to fight the Germans in their drives, which followed the cessation of fighting on the Russian side.

When the boys joined the Aviation Section they were promised that their commission on graduation would be the commission of first lieutenant. The same was true of those who joined in the United States, as well as of those who were transferred to the American forces from the Franco-American Flying Corps.

Then, some weeks ago, both sons, the one in Italy and the one in France, write home in utter disgust that the United States Government is going back on its promise and wants them to accept a second lieutenancy instead of a first lieutenancy, with a corresponding decrease in pay.

I will further beg your indulgence and the indulgence of your readers and ask you to place yourself in the position of the father or mother who, after all the trouble, work and efforts to make it possible for their boys to be of service to their country, and after spending considerable sums in equipping them with the things which the Government should supply them, receive a letter from their son reading as follows:

"The time has come when the camel has been overloaded and his back is done broke down. I am writing this sob to you in hopes that somewhere in ——— you can find a little influence that will push our story before the proper people (proper is Squier) and have some of the load taken off.

"To go back to the days of Ground School—you remember that the Honor Men of the graduating squadrons were given the Honor (?) of training abroad and the less fortunate and the lazier men were training in the States. You will also recall that I worked like hell to come across—made the grade and finally landed down here in Italy where it is colder than ———, but no coal is present. You will also recall that on our application blanks and under the General Orders No. 55, under which I enlisted in the Aviation Section of the Signal Corps, we were all to qualify for 1st Lieutenants. Now we have just received the cheering news that all men recommended for commissions after Dec. 5th would receive 2nd Lieuts. regardless of ability, etc.

"In other words, while we were touring Europe 3d class, waiting and waiting, and now while we are in a school where it takes just twice as long to finish a Militaire Brevet that is about a hundred times as hard as the R. M. A. of the States—the men who flunked their work in the States—the men who loafed and fooled before we were even allowed to start—got their little 1st Lieut. commissions and will now come over here to learn the flying game and boss us around. We will be 2nd Lieuts. and not 1st. Can you beat it?

"Please understand that this crowd is not a bunch of commission grabbers—because all but about 25 out of 300 men have already turned down 1st or better—I even did that myself when the Major offered it to me in U. S. A. But we feel that we should get *at least* the same as the others.

"As the Britisher says, it's a real war and we'll all see it thru, Private or General, but we don't feel like getting stung *all* the time." ....

The letter from the boy who is in France is even more bitter, and we find in going to the officials in Washington and to our Congressmen and Senators and to the Aero Club of America authorities that the fathers and mothers of all the American boys in France and Italy have received similar letters. We find further, that everybody believes that this action has caused needless trouble, worry and loss of time and money.

We find that the military authorities in France as well as in the United States, deplore the action that has brought about all this trouble and worry, and disapprove the principle of cutting down the pay of combatants in the face of the enemy.

The Aero Club of America, which was literally flooded with protests from American Army officers, aviators, fathers and mothers, after giving thorough consideration to the subject, wrote to Secretary Baker, Mr. Howard E. Coffin, Chairman Aircraft Board; Congressman H. Hubert Dent, the Chairman of the House Committee on Military Affairs, and Senator George E. Chamberlain, Chairman, Senate Committee on Military Affairs, as follows:

"Dear Sir:

"A dispatch from France states that the American aviators over there are worrying over the report from Washington that there is legislation under contemplation intended to revoke the law granting the increase in pay for duty which requires constant participation in aerial flights.

"Kindly advise whether there is any such change under consideration, and whether there is any danger of its being adopted.

"We beg to submit the following facts to show that it would be very unwise and against the best interests of the United States and the Allies to deprive military aviators of their extra pay for flying duty:

"(1) Aeronautics being still in its infancy, it has not been possible to define exactly what amount of clothing, instruments, books and other equipment a military aviator must have to make him efficient under war conditions. As a result, military aviators at present are only supplied by the Government with part of the equipment which they actually need to maintain their efficiency, and even their present salary is insufficient to meet their actual needs.

"(2) The Aero Club of America has been co-operating with the patriotic Aviation Section of the National Special Aid Society and the Woman's Naval Service in arranging to supply the needs of military and naval aviators, and finds that the needs of each aviator, which are not met by the Government at present, total to several hundred of dollars when the equipment is bought in the United States, and more when the equipment is bought in France or in England, where the prices are higher.

"(3) There is no other branch of the Service outside of the Air Service where the individual,—rather than the organization,—is the fighting unit, and where the difference between victory and disaster depends so largely on the individual's well being and mental alertness.

"(4) Lord Kitchener stated that an aviator is worth an army corps. We know that it takes an average of 100 hours of flying, at a minimum cost of $1.50 a minute, to make a military aviator; and that when an aviator crosses the fighting lines he and his aeroplane and equipment represent an investment of between $35,000 and $50,000. Having cost that much, we owe it to ourselves not to decrease his efficiency by decreasing his pay, and thereby depriving him of the means with which to pay for the extra equipment that he needs.

"(5) We also know that the aviator's needs in clothing and equipment are large and the Government stops at bare needs, and the aviator must pay for the costly equipment out of his pay. Of the hundreds of American aviation students sent to France, those who did not have independent means and whose pay did not permit them to purchase the clothing and equipment they needed had to sail without them. They hoped to purchase them in France after receiving their next pay, but they found the price prohibitive.

"(6) It is hardly necessary to point out that a man numb with cold can make but little progress in training to pilot an aeroplane under war conditions and that being numb with cold he is more apt to misjudge distances and wreck his aeroplane in landing than he would be if he were comfortably dressed. Likewise a numb aviator cannot cope with a comfortably dressed enemy. Therefore, something should be done to meet more fully the aviators' needs, rather than to inflict further hardships by cutting down their pay.

"(7) At present aviation officers of the Signal Corps and officers attached to the Signal Corps, while on duty which requires them to participate regularly and frequently in aerial flights, are entitled to an increase in the pay of their grade, under their commissions, as follows: Aviation officers, 25 per cent; junior military aviators, 50 per cent; military aviators, 75 per cent. Each junior military aviator and each

(*Continued on page* 1039)



The News of the Week



Censor Removes Restrictions on News From Army Camps

The Committee on Public Information made public a general order which was sent out to camp commanders of the National Army cantonments and National Guard camps throughout the United States.

By the provisions of the order, persons in the military service are permitted, under certain restrictions, to write freely for publication both for newspapers and magazines. All correspondence intended for publication must be submitted by the soldiers to a military censor, but newspaper correspondents are not bound to do so, provided that obey the general restrictions prescribed by the Committee on Public Information.

Coffin Favors Centralized Purchasing

Testifying before the Senate Committee on Military Affairs, of which Senator Chamberlain is chairman, Howard E. Coffin, chairman of the Aircraft Board, endorsed the measures for a War Cabinet and a Director of Munitions, which Senator Chamberlain and others have been urging.

Mr. Coffin presented strong reasons for the adoption of the bills, pointing to the necessity of keeping all the non-essential industries intact and undisturbed during the war, in order that the entire industrial structure should not be destroyed. This can only be accomplished by the centralization of authority, asserted Mr. Coffin.

Aviators on Torpedoed Transport

The War Department announced that among the units on board the Tuscania, which was torpedoed in British waters by a German submarine with a loss of 267 lives, were the following units: The 100th Aero Squadron, the 158th Aero Squadron and the 213th Aero Squadron. It is not known whether other aeronautic units were on the ill-fated ship.

Hammered Piston Ring Company Incorporates

The Hammered Piston Ring Company of America has filed articles of incorporation with the State Tax Commission of Maryland, with an authorized capital of $1,400,000.

This corporation has taken over the plant, fixtures, equipment, trade-marks, etc., of the American Piston Ring Company of New Jersey, which has a large plant at Newark. Among its customers are many well-known high-grade motor car concerns. Both the ring and method of manufacture of piston rings used by the concern are patented.

Winter Impedes Aerial Training

The heavy fall of snow throughout the Middle West has greatly impeded training at the various aviation fields, and the cadets have concentrated more than usual on class work.

Advices from Chanute Field indicate that plans for the sending away of certain units from the field came to a complete halt upon the appearance of the second severe blizzard within the last few days.

Rest Home for American Aviators in France

Thanks to the generosity of an unnamed Frenchman, American aviators who are injured in the course of their training or succumb to the twin maladies to which aviators are susceptible—jumpy nerves or staleness, like the athlete's—will be able to recuperate in a beautiful French chateau nicknamed "Bliss House."

The chateau is four miles from a large American aviation training field and will be of great service to the flyers as a place where they can rest quietly in the hospitable recreation rooms.

Bliss House is a new departure, but it is only one manifestation of the expansion of the canteen at this particular aviation field, which was the first the Red Cross established with the American force. It originally occupied one hut, but now extends through seven barracks. These institutions have been so successful that others have been established for officers and cadets.

Duesenberg Buys Fiat Plant

Announcement is made that the Duesenberg Motors Corporation has purchased the factory, factory equipment and property of the Fiat Motor Car Company at Poughkeepsie, N. Y. This has been done in order to increase production on the big contract which the Duesenberg Motors Corporation is now working on for the United States Government.

In addition to the purchase of the big Fiat plant, the present large, model factory of the Duesenberg Motors Corporation at Elizabeth, N. J., is to be immediately doubled, with a strong possibility of an additional increase in floor space after that.

It is understood that the Fiat Company has anticipated material conditions and labor conditions and have completed the machine work and much of the assembling of their total output for 1918. A small portion of the Poughkeepsie plant is to be used by the Fiat Company for completing the assembling of their 1918 cars and also to act as a service station and repair parts depot. With this big addition to the production ability of their organization, the Duesenberg Motors Corporation can go ahead of their delivery dates in turning over to the Government completed motors so urgently needed in connection with the Aviation Program.

The Duesenberg Motors Corporation, manufacturers of aeroplane, automobile and marine engines, are admittedly one of the most highly specialized organizations in the country. Their knowledge of both motors and motor manufacturing is such that it is only logical they should become a big cog in the massive wheel of American aeroplane production. That this organization has withdrawn all its regular motors from the market and turned its entire resources over to producing motors for the Government is but additional evidence of how our big commercial institutions are bearing the burden and throwing their every effort back of the Government to bring this war to a quick and successful conclusion.

No Shortage of Aeroplane Mechanics

The National Advisory Committee for Aeronautics has issued the following bulletin:

"There will be no shortage of aeroplane mechanics. Statistics gathered by the National Advisory Committee for Aeronautics from the records of the Signal Corps of the War Department show that this branch of the service is well organized to supply the requisite number of repairmen to keep our aerial fleet in action, after it gets well started.

"Effort is made to secure aeroplane mechanics from voluntary enlistment, induction, draft, and selection from the National Army and National Guard. Men so obtained are trade-tested at the place of mobilization and organized into squadrons. Any trade list which is found short is filled by training men who have the necessary qualifications.

"Aeroplane mechanics are formed into service, supply, repair and construction squadrons of 150 men each, of various trades, and these squadrons are given intensive training eight hours per day for 30 days, after which each squadron is ready for active service as a complete unit.

"Under this plan thousands of enlisted men are now in training at various schools and manufacturing establishments. This work is being constantly enlarged.

"Engine mechanics for the four motor mechanic regiments now being organized at Camp Hancock, Augusta, Georgia, have been and are being secured through a system of selection from National Guard and National Army, and men of the required qualifications already enlisted in the aviation service.

"The balloon service is able to secure practically all of the trades required in enlisted men by selection from aviation recruits. The necessary training to make these men work as a team is given to them at the various balloon schools."

Eagle Aviation School Active

With an instruction staff headed by three aviation officers direct from the firing line, the Eagle Aviation School has been established at No. 114 West Forty-second Street, New York City, to teach all branches of aviation to students. The staff is headed by Lieut. W. Knox Denham, of the Royal Flying Corps, who has had two and one-half years' experience. He is assisted by Lieut. Lynch and Lieut. Jardine, both of the Royal Flying Corps and both with two years of experience.

The school has flying facilities at Farmingdale, Long Island, which will be used for the training of students in actual flying. In its New York class rooms will be taught such subjects as engines, planes, aerodynamics, construction, riggings and Lewis gun instruction. In the class rooms is a Curtiss J. N. 4 flying machine and several engines, besides a Lewis gun, so that the instructors are able to combine theory and practice.

The fuel administrator has granted exemption to the school so that it will be able to keep open on Mondays. Besides morning and afternoon classes there is also a night class.

American Aviators in France

According to official announcement, the American sector on the western front has become a reality. In addition to lively artillery exchanges, our troops have been subject to aeroplane attack. On February 5th, according to the Associated Press, American anti-aircraft guns were kept busy repelling attempts of a squadron of twenty German aeroplanes to cross over our lines, and two, more persistent than the others, were finally driven off by the effectiveness of our anti-aircraft fire.

American aviators in the Lafayette Escadrille have conducted very successful operations against enemy aeroplanes. Taking advantage of fine weather in the first days of February, three German machines were brought down without incurring the loss of any of their own machines. Corporal Thomas Hitchcock, of Westbury, L. I., brought down two of these



Aeroplane turnbuckles being manufactured by women who are replacing men in munitions plants. (© Committee on Public Information)



The German who flew this machine met a French ace
(© Committee on Public Information)

within a short time, and David E. Putnam, of Brookline, Mass., brought down another, his third victory.

In a thrilling duel, Francis Peabody Magoun, Jr., a Harvard graduate, member of the Royal Flying Corps, brought down a crack German aviator. Magoun has been a member of the Royal Flying Corps for some time, but has only had two months of service at the front. He is a member of the Harvard class of 1915.

Lieutenant Joseph C. Stehlin has returned to the United States after resigning from the Lafayette Escadrille. Stehlin has four victories officially credited and has brought down seven enemy planes in forty-one combats. Twenty days after he was made a full-fledged aviator he brought down his first Boche. It is expected that Stehlin will enlist in the American Air Service.

Two American aviators accompanied a French escadrille on a bombing expedition on the night of February 5th. The Frenchmen had dropped their bombs and on their return trip encountered a squadron of eight enemy planes. A general engagement ensued in which one of the Americans destroyed his opponent and the other succeeded in driving off the enemy. The Frenchmen congratulated the American airmen, who were only recent graduates from the flying school, for their efficiency and courage.

Dr. Arbuthnot, a member of the Pittsburgh University Medical Unit and formerly dean of the University, captured a German aviator single handed, according to a letter received from Dr. J. Hubert Wagner. The German aviator had been shot down and the dean made him a captive before he had time to destroy his machine.

Two American members of the British Red Cross, working on the Italian front, were killed by German air raiders, according to official announcement. They are Richard Fairfield of Philadelphia and William Pratt of Baltimore.

Announcement has been made that before August of this year radio communication will be established between Arlington and the American headquarters in France by means of a new station under construction by the Navy Department at a cost of $2,250,000. The station is to be turned over to the French Government at the conclusion of the war.

Russians Call Aviation Congress

A report from Russia received by wireless gives an urgent proclamation sent by the Russian Government, calling a congress of all aviation detachments and groups on the northern, western, southern and Rumanian fronts. The Congress will be held in Petrograd on February 10th for the purpose of accomplishing the unification of aerial activities on all fronts, reorganization of aircraft and aircraft industries, the discussion of aviation progress, as well as for the consideration of proposals for peace time activity.

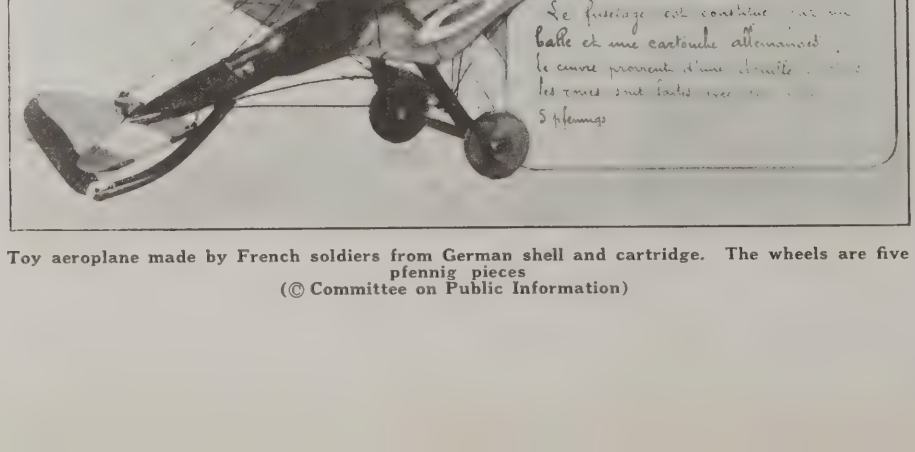
The requirements and directions for the appointment of delegates have been very rigidly drawn up. They will be elected by general, direct and secret ballot, and must possess various qualifications to be eligible as representatives of their respective squadrons.

Youthful American Aviator Downs Two Germans

Corporal Thomas Hitchcock, of the Lafayette Escadrille, downed two enemy aeroplanes within a short time of each other.

Corporal Hitchcock is the son of Captain Thomas Hitchcock, executive officer of the aviation field at Mineola, and quite well known in this country and Europe as a polo player and horseman.

The successful pilot attempted to enter the American air service, but because of his youth was rejected. Hitchcock is only 17 years of ago. He received a Croix de Guerre with one palm when he downed his first plane.



Toy aeroplane made by French soldiers from German shell and cartridge. The wheels are five pfennig pieces
(© Committee on Public Information)

British Mission Hangar Demolished at Washington, D. C.

High winds blew down the aeroplane hangar of the British Aviation Mission, located in Potomac Park, at Washington, D. C., Monday. The two large biplanes brought to this country were not damaged by the collapse of the hangar.

The biplanes, which are of the Avro type largely used for training purposes in England, had not been unpacked, so the aviators stated, and that alone accounted for their escape from serious damage.

The continued cold weather has been the only thing that is holding back the British aviators from making their intended flights over Washington.

Aids Nation to Get Hardwoods

For the purpose of keeping the Government in touch with the hardwood producer and thereby increasing facilities for the manufacture of ships, aeroplanes and other war supplies in which hardwoods are used, the National Hardwood Lumber Association has established a War Service Bureau, which will keep tab on practically the entire hardwood market of the United States, Canada and some other countries.

Frank F. Fisher is in charge of the new bureau. His offices are at 332 Munsey Building.

"The National Hardwood Lumber Association has established this bureau," said Mr. Fisher, "at the request of the director of lumber of the raw material division of the Council of National Defense. We will assist the Emergency Fleet Corporation, the Signal Corps Division and other departments in locating hardwood as it is needed.

"In addition to keeping on hand inventories of virtually all hardwood stock in the United States, Canada, the Philippine Islands and Cuba, the bureau will maintain a force of competent inspectors of hardwood, whose services will be at the disposal of the Government in large producing centers. This service will be of great help to the Government, as trained hardwood inspectors are scarce. The inspection service, it is said, will save the Government much money and insure it getting good material and honest count.

"The National Hardwood Lumber Association has a membership of nearly 1,000 hardwood lumber concerns in 26 States, Canada, the Philippine Islands and Cuba, and all of these concerns will keep on file with the bureau accurate inventories of all stock on hand. At any time the Government needs materials at any given point, the bureau is in a position to advise as to the nearest point where such material can be obtained."

Germans Consider Trans-Atlantic Flight

In a contribution to the Journal of the Association of German Engineers, Major von Parseval, the inventor of the dirigible that bears his name, discusses the future possibilities of aerial communications between Germany and America, basing his calculations on the assumption that the route chosen would lead from Cologne to the Azores and thence to the nearest point in the United States.

Major von Parseval devotes himself to an examination of the question whether it is possible to accomplish the second half of the voyage, and arrives at a negative conclusion. Parseval believes that the development of large aeroplanes does not improve the prospects of making the trans-Atlantic flight, but pins his faith on the lighter-than-air machine.

Manual of Military Aviation

As the author points out in his preface a strong and well organized air service is a vital accessory of the modern military machine and a highly trained, specialized personnel must be provided. The present volume is intended to suppliment the training of such an air force and provide a work of reference especially on the theoretical side. The author has based his book on the rules, regulations and practices existing in the Aviation Section of the United States Army, and upon common practice followed in foreign air organizations. He is especially well equipped to prepare such a text book, holding the rank of Major and having served as Chief Instructor in the Field Officers' Course in Aeronautics. Major Muller holds the American altitude record and has received certificates as expert aviator, airplane pilot and free balloon pilot from the International Aeronautic Federation. The rules governing the selection and operation of aircraft stations and the duties of the crews are set forth in detail. Several chapters are devoted to the care of materials, their action and readjustment. In another section the navigation of the air is treated very fully, while a large part of the book is taken up with problems of military aviation. The volume is printed on very light paper, in pocket size, which will make an especial appeal to airmen. "Manual of Military Aviation," by Major Hollis Leroy Muller. Obtainable at The Aeronautic Library, 280 Madison Ave., New York City. The price is $2.60 postpaid.

NAVAL and MILITARY AERONAUTICS

Forty-Five "Aces" of the Air

An official list of French Aviation "Aces" has published by the French Aero Club. To be an "ace" a pilot shall have destroyed five enemy machines, which must fall inside the French lines.

The list includes Lieutenant Raoul Lufbery, star pilot in the Lafayette Escadrille, who is credited with having destroyed seventeen German machines, while four others which he shot down fell within the German lines, and are not recognized by the French authorities. Lufbery is now a Major in the United States Army and it is quite probable he will be sent to America as instructor in flying.

Seargt. Major Constant Soulier, who has brought down seven German machines, is the youngest of the French "Aces," he being barely twenty years old. He has been sent to America by the French Government as instructor to American pilots. The following is the official list:

Names	Number of Machines Destroyed
Lt. Nungesser	30
Capt. Heurteaux	21
Sub.-Lt. Fonck	19
Capt. Deullin	18
Sub.-Lt. Lufbery	17
Sub.-Lt. Madon	17
Capt. Pinsard	16
Sub.-Lt. Navarre	12
Sub.-Lt. Chaput	12
Sub.-Lt. Jaillar	12
Sub.-Lt. Tarascon	11
Sub.-Lt. Ortoli	11
Sub.-Lt. Boyau	10
Sgt. Maj. Chainat	9
Capt. de la Tour	9
Sub.-Lt. Casale	9
Sgt. Major Douchy	8
Lt. Vaillet	8
Sgt. Maj. Vitalis	7
Sub.-Lt. Flachaire	7
Sgt. Maj. Soulier	7
Sgt. Maj. Sayaret	7
Sub.-Lt. Nachman	7
Sub.-Lt. Hugues	7
Sgt. Montrion	7
Lt. Losie	6
Private Guerin	6
Lt. de Bennefoy	6
Capt. Derode	6
Sgt. Soulier	6
Sgt. Maj. Herblin	6
Lt. de Sevin	6
Private Martin	6
Sgt. Maj. Bloch	5
Lt. Gastin	5
Lt. Borzecky	5
Sgt. Rousseau	5
Lt. de Turenne	5
Maj. de Marancourt	5
Sgt. Maj. Herisson	5
Lt. Marty	5
Lt. Mortmart	5
Sgt. Quette	5
Sgt. Maj. Blanc	5
Lt. Reguier N.	5

Thirteen French "Aces" have been killed in aerial fights, among whom was Captain Guynemer, who before his death, had shot down more than ninety German machines, of which only fifty-three were officially recognized as having been brought down in the French lines. Sub.-Lt. Pegoud, who met his death at the front, after having shot down six enemy machines, was the first French Pilot to loop the loop. Both Guynemer and Pegoud met their deaths in unequal fights, Guynemer in a fight over Belgium territory being attacked by seven German machines. Pegoud met his death over the region of Belfort in a fight with a big German three seater machine carrying two machine guns, while his plane mounted only one.

Commissions and Promotions

The following appointments were made in Officers' Reserve Corps on January 22nd:

To be Captain, Signal Reserve: Oscar C. Brill.

To be Second Lieutenant, Signal Reserve: Carl L. Gregory.

To be First Lieutenants, Aviation Section, Signal Reserve: Sewall Cutler, Rutherford S. Pierrepont, Paul R. Plummer, Edward A. Wadsworth.

To be Second Lieutenants, Aviation Section, Signal Reserve: George D. Coleman, Harry P. Disher, Arthur F. Humphrey, George Newell Hurd.

The following appointments, made at the School of Military Aeronautics opposite each name, have been approved by this office:

To be First Lieutenants, Aviation Section, Signal Reserve: Eldridge T. Spencer, Frederick E. Edwards, Henry G. Andrews, Leo F. Post—all of Rich Field, Waco Tex., January 11th, 1918.

Appointments made on January 23rd, 1918:

To be Major, Aviation Section, Signal Reserve: Alfred Wilson Harris.

To be Captains, Aviation Section, Signal Reserve: Gene H. Fonda, Perry M. Graves, Joseph F. Holmes, Walter C. Morris, John Mumford, Frank X. Murray.

To be First Lieutenants, Aviation Section, Signal Reserve: James A. Alen, John L. Bender, Herbert A. Conners, Hugh Burgess Giles, Samuel C. Gordon, Charles Kent Henninger, John A. Hitchens, John Ralph Kearns, Felix Lewin, William J. McKelvey, Herbert Harvey Parents, Richard H. Randall, George O. Reynolds, Richmond



One of the Army aviation training fields, showing Curtiss JN-4 school planes. (© Committee on Public Information)

Rochester, Jr., William Van Kirk, Herbert N. Williams.

To be Second Lieutenants, Aviation Section, Signal Reserve: Robert E. Hine, Charles F. Huntington, Norman Lawson.

The following appointments, made at the School of Military Aeronautics opposite each name, on the dates indicated, have been approved by this office:

To be First Lieutenants, Aviation Section, Signal Reserve: Raymond W. Kearney, Love Field, Dallas, Tex., January 14th, 1918; August G. Rehlmeyer, Love Field, Dallas, Tex., January 14th, 1918; Hubert DeV. McLean, 15th Aero Squad., L. I., January 16th, 1918.

Appointments made on January 24th, 1918:

To be Captains, Aviation Section, Signal Reserve: Henry M. Darling, Joseph O. Donovan, John S. M. Eley, Herbert E. Ives.

To be First Lieutenants, Aviation Section, Signal Reserve: Maurice J. Carey, Albertus T. Dudley, James C. Fleming, William D. Irvine, John W. Lane, Jr., Edward Lewis, Clay Littleton, Harley F. McCurdy, Clarence B. Mitchell, Merrill B. Moores, Albert H. Morrill, Joseph C. N. Rowell, Burt A. Skellan, Charles E. Townsend.

To be Second Lieutenants, Aviation Section, Signal Reserve: Theodore H. Bailey, Jr., Felix Borzynski, Charles S. Bouchard, Edgar L. Bradley, Jr., James L. Hamilton, Elisha C. Howes, Jr., William A. Jones, Jr., Robert B. Lindsey, Albert J. McLaughlin, Harold G. Miller, Charles W. Muldoon, Joseph H. O'Connell, Edgar B. Whitledge, Warner D. Orvis.

Appointments made on Officers' Reserve Corps, January 25th, 1918:

To be Captains, Aviation Section, Signal Reserve: Benjamin Hart, Thomas J. Ward.

To be First Lieutenants, Aviation Section, Signal Reserve: Samuel S. C. Chilcote, Charles H. Fiske, Jr., Thomas N. Metcalf.

To be Second Lieutenants, Aviation Section, Signal Reserve: Harold J. Fischer, Hayes Hall, Verner D. Sapp, Clarence B. Swayne, Morris B. Wilder.

Appointments made on January 26th:

To be Captains, Aviation Section, Signal Reserve: Roderick D. Grant, 2146 Cornell Rd., Cleveland, O.; Levin D. Laning, Petersburg, Ill.; William G. Renwick, 24 Milk St., Boston, Mass.; George E. Sykes, Rockville, Conn.

To be First Lieutenants, Aviation Section, Signal Reserve: John J. Browne, Packard Motor Car Co., Detroit, Mich.; Thomas S. Bubier, Kelly Field, San Antonio, Tex.; Perry Emigh, 501 Montgomery Drive, Portland, Ore.; James Benton Grant, 1639 19th St., N. W., Washington, D. C.; Chester A. Repman, Vancouver Barracks, Wash.; Alfred Schaff, St. James Hotel, Washington, D. C.

To be Second Lieutenants, Aviation Section, Signal Reserve: Francis M. Hannon, Eberts Field, Lonoke, Ark.; Frank M. Henry, Ft. Omaha, Neb.; Harold R. Irish, Silverton, Ore.; Harry G. Montgomery, Ft. Omaha, Neb.; Harold J. Porlier, Kelly Field, San Antonio, Tex.; Rufus B. Rogers, Kelly Field, San Antonio, Tex.; Harold W. Turner, Kelly Field, San Antonio, Tex.

Appointments made January 28th:

To be captains, Aviation Section, Signal Reserve: Victor H. Henderson, 136 K St., N. E., Washington, D. C.; Frederick H. Randall, Box 602, Santa Barbara, Cal.; Richard Vaux, Three Puns P. O., Montgomery Co., Pa.

To be First Lieutenants, Aviation Section, Signal Reserve: Harry P. Ashe, Garden City, L. I., N. Y.; James I. Coleman, Kelly Field, San Antonio, Tex.; William R. Kiefer, Office Chief Signal Officer, Washington; Oscar L. Lefferts, Ft. Omaha, Neb.; Nolan D. Mitchell, 3616 N. H. Ave., N. W., Washington, D. C.; Charles H Monroe, Amex. Forces, France; Isaac Warner Roberts, Kelly Field, San Antonio, Tex.; Jacob S. Schlussel, Kelly Field, San Antonio, Tex.; Jacob S. Sides, Kelly Field, San Antonio, Tex.; John B. Slimm, Cornell Univ., Ithaca, N. Y.; Harold L. Walton, Kelly Field, San Antonio, Tex.

To be Second Lieutenants, Aviation Section, Signal Reserve: Gilbert R. Eichelberger, Dayton, O.; Henry J. Foster, Camp Upton, N. Y.; Hally M. Scott, 1023 16th St., N. W., Washington, D. C.; Sidney E. Short, Cornell Univ., Ithaca, N. Y.

The following appointments in the Officers' Reserve Corps have been made in the office of the Adjutant General:

January 29, 1918.

To be Major, Aviation Section, Signal Reserve: Guy E. Logan, State House, Des Moines, Ia.



Capt. G. T. Hanley, of Providence, R. I., with American Air forces abroad

To be First Lieutenants, Aviation Section, Signal Reserve: Golden H. Benefiel, Chanute Field, Rantoul, Ill.; Adolph Stuber, 119 D St. N. E., Washington, D. C.; Harry E. Williams, Addison Hotel, Detroit, Mich.

To be Second Lieutenants, Aviation Section, Signal Reserve: Henry T. Bangs, 119 D St. N. E., Washington, D. C.; Edward S. Clark, Mineola, L. I., N. Y.; Frank Graham, 621 S. Yakima Ave., Tacoma, Wash.; John W. Howard, 1023 16th St. N. W., Washington, D. C.; Lewis P. Kinsey, 1845 Collingwood Ave., Toledo, O.

January 30, 1918.

To be Captains, Aviation Section, Signal Reserve Corps: William L. Carbine, Box 1561, Jacksonville, Fla.; Robert L. Chamberlaine, 119 D St. N. E., Washington, D. C.; Edwin B. Lausier, 208 W. 72d St., New York, N. Y.; Thomas H. McHatton, 163 Mell St., Athens, Ga.; John J. Marquette, 142 W. 94th St., New York, N. Y.; Edwin P. Webb, 400 Cerillos Rd., box 369, Santa Fe, N. M.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Edwin F. Kingsbury, 1023 16th St. N. W., Washington, D. C.; Stanley D. Livingston, 1710 Penn. Ave., Washington, D. C.; John J. Meade, care Pittsburgh Model Engine Co., Pittsburgh, Pa.; David G. Ong, 119 D St. N. E., Washington, D. C.; Tasso V. Orr, 147 Granville Pl., Memphis, Tenn.; William D. Rogers, 119 D St. N. E., Washington, D. C.; Charles H. Smith, 119 D St. N. E., Washington, D. C.; James H. Wolfe, Univ. Club, Salt Lake City, Utah.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Hudson C. Burr, 124 W. 123d St., New York, N. Y.; Calvin E. Davis, 152 Temple St., New Haven, Conn.; James T. Leidigh, Rockwell Field, San Diego, Cal.; Henry F. L. Milstrey, 415 S. 7th St., Newark, N. J.; Joseph B. Plush, 4233 Otter St., Philadelphia, Pa.; William H. Rust, 204 N. Columbus St., Alexandria, Va.

January 31, 1918.

To be Captain, Aviation Section, Signal Reserve Corps: Jay L. Crouse, 119 D St. N. E., Washington, D. C.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Alonzo J. Grover, 4111 N. Howard St., Spokane, Wash.; Oliver F. Johnson, care Wright Aero. Corp., Buffalo, N. Y.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Leland B. Bass, Ga. School of Tech., Atlanta, Ga.; Elmer J. Bowling, Ft. Omaha, Neb.; Kinsey Burr, Ft. Omaha, Neb.; Orin J. Bushey, Ft. Omaha, Neb.; Harold Cogswell, Ft. Omaha, Neb.; Charlton W. Corwin, Ft. Omaha, Neb.; Isaac H. Coulter, Ft. Omaha, Neb.; Arthur B. Cragin, Ft. Omaha, Neb.; Cylde E. Cretsinger, Ft. Omaha, Neb.; Earl H. Diggs, Ft. Omaha, Neb.; Duncan L. Edwards, Ft. Omaha, Neb.; Harry C. Hahlbeck, Ft. Omaha, Neb.; Henry F. Hauserman, 7020 Burnham Ct., Cleveland, O.; Arthur B. Hillabold, Ft. Omaha, Neb.; Herman J. Hinsman, Ft. Omaha, Neb.; John S. Holloran, Jr., Ft. Omaha, Neb.; Cylde A. Kuntz, Ft. Omaha, Neb.; Kenneth C. Ovitt, Ft. Omaha, Neb.; Herman B. Post, Ft. Omaha, Neb.; Samuel E. White, Ft. Omaha, Neb.; Robert T. Williams, Ft. Omaha, Neb.

February 1, 1918.

To be Captains, Aviation Section, Signal Reserve Corps: James G. Anthony, 320 B St. N. E., Washington, D. C.; Joseph St. G. Bryan, 15 Park Row, New York, N. Y.; Alfred O. Girard, 119 D St. N. E., Washington, D. C.; Milton J. Warner, 119 D St. N. E., Washington, D. C.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Michael J. Gerlowski, American Forces (care of Chief of Service); William F. Gleason, 119 D St. N. E., Washington, D. C.; Guy E. Heath, 117 E. Main St., Corry, Pa.; Otto C. Keil, 1015 Rhode Island Ave. N. E., Washington, D. C.; John K. Mills, Kelly Field, San Antonio, Tex.; Charles A. Ritzman, 119 D St. N. E., Washington, D. C.; Havelock Walser, 20th St. and Florida Ave., N. W., Washington, D. C.; George Winchester, Wash. & Jeff. Univ., Washington, Pa.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Morse A. Anderson, Ellington Field, Houston, Tex.; Robert L. Campbell, 119 D St. N. E., Washington, D. C.; John W. Davis, Jr., Ellington Field, Houston, Tex.; Joseph P. Dunne, Ellington Field, Houston, Tex.; John M. Foy, Ellington Field, Houston, Tex.; Horace W. Frost, 1834 Columbia Road, Washington, D. C.; Albert H. Hankey, Ellington Field, Houston, Tex.; Harold K. Holliday, Ellington Field, Houston, Tex.; Greene H. Jones, Ellington Field, Houston, Tex.; Henry N. Moore, 119 D St. N. E., Washington, D. C.; Harry B. Nickell, Ellington Field, Houston, Tex.; Thomas M. Robertson, 117 E. 38th St., New York, N. Y.; Hyman I. Robinson, 101 N. East Ave., Baltimore, Md.; E. Caroll Stollenwerck, Kelly Field, San Antonio, Tex.; John W. Turner, Ellington Field, Houston, Tex.; Arthur J. Walker, Ellington Field, Houston, Tex.

February 2, 1918.

To be Captains, Aviation Section, Signal Reserve Corps: George M. Brett, 404 W. 116th St., New York, N. Y.; Donald M. Liddell, 918 19th St. N. W., Washington, D. C.; John K. White, 119 D St. N. E., Washington, D. C.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Percy George McVetty, Cornell Univ., Ithaca, N. Y.; Frank A. Weaver, 1025 Engrs. Bldg., Cleveland, O.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Homer D. Burch, 256 Union Station, Washington, D. C.; William H. Dayton, Rockwell Field, San Diego, Cal.; Thomas F. Egan, Mineola, L. I., N. Y.; Jesse K. Fenno, Rockwell Field, San Diego, Cal.; Joseph O. Freck, 805 Pittock Block, Portland, Ore.; Clare Grafa, Rockwell Field, San Diego, Cal.; Dewitt T. Henderson, Rockwell Field, San Diego, Cal.; Donald E. Sias, Rockwell Field, San Diego, Cal.; Robert S. Worthington, Rockwell Field, San Diego, Cal.; Oval Nelson Bryan, Nashville, Tenn.; Harry Judge Craycroft, Fresno, Cal.; George L. A. Dale, 30 N. Michigan Ave., Chicago, Ill.; Robert R. Fox, 6 Bradford Ave., Detroit, Mich.; Julius Girard Newgord, 205 Amer. Bank Bldg., Everett, Wash.; Ambrose Henry Mouser, Latty, O.; Charles Robert Sowder, Camp Custer, Mich.; William Lowery Sharp, Little Rock, Mo.; John David Trawick, 820 Starks Bldg., Louisville, Ky.; Allen Augustus Weeden, 172 Main St., Woonsocket, R. I.; Charles Aprenia Wayland, 140 N. 3d St., San Jose, Cal.; John Edward Walton, Medora, Ill.; Thomas Cox, 1244 Pleasant St., Fall River, Mass; Louis Jacob Pritzker, 4817 Sheridan Rd., Chicago, Ill.

February 4, 1918.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: John J. Cadot, Newhouse Bldg., Salt Lake City, Utah; Chester B. Coubleday, 53 E. 61st St., New York, N. Y.; Michael A. McKinney, Jr., Langley Field, Hampton, Va.; Ralph H. Matthiessen, 7 E. 42d St., New York, N. Y.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Edwin DeW. Ackerman, 119 D St. N. E., Washington, D. C.; William A. Barnhill, Langley Field, Hampton, Va.; Paul R. Blair, Ga. School of Tech., Atlanta, Ga.; Martin T. Fisher, U. S. Patent Office, Washington, D. C.; John C. Grier, Jr., 1816 S St. N. W., Washington, D. C.; James G. McNett, Langley Field, Hampton, Va.; Elmer D. Mitchell, Univ. of Texas, Austin, Tex.; George Harold Pfau, Arlington Hotel, Washington, D. C.; George W. Rogers, Kelly Field, San Antonio, Tex.; Ferdinand W. Scharen, Kelly Field, San Antonio, Tex.

February 5, 1918.

To be Captain, Aviation Section, Signal Reserve Corps: Albert Hoevenhoff, Ft. Sam Houston, Tex.

To be First Lieutenant, Aviation Section, Signal Reserve Corps: Wellington Arnold, Kelly Field, San Antonio, Tex.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: George H. Burgess, Ellington Field, Houston, Tex.; John S. DeCamp, 2507 Wisconsin Ave. N. W., Washington, D. C.; Charles Rosenbaum, Kelly Field, San Antonio, Tex.; Arthur E. Zipse, Ellington Field, Houston, Tex.

The following appointments authorized by the Secretary of War, and made at the Military School of Aeronautics designated opposite each name, on the dates indicated, are approved:

February 1, 1918.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Lloyd H. DeShong, Gerstner Field, La., Jan. 19, 1918; Thomas R. Evans, Rockwell Field, Cal., Jan. 15, 1918; William H. Hoff, Kelly Field, Tex., Jan. 23, 1918; Rutledge M. Lawson, Gerstner Field, La., Jan. 19, 1918; James G. Ray, Gerstner Field, La., Jan. 17, 1918; Thomas P. Sandefur, Rockwell Field, Cal., Jan. 17, 1918; James R. Worthington, Rockwell Field, Cal., Jan. 15, 1918.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Emil S. Anderson, Gerstner Field, La., Jan. 15, 1918; Melvin C. Aney, Gerstner Field, La., Jan. 15, 1918; Robert J. Brown, Jr., Ellington Field, Tex., Jan. 21, 1918; Charles M. Commins, Gerstner Field, La., Jan. 15, 1918; John P. Davies, Ellington Field, Tex., Jan. 17, 1918; Henderson K. Franzheim, Ellington Field, Tex., Jan. 17, 1918; Claude F. Gilchrist, Ellington Field, Tex.; Jan. 17, 1918; Robert F. Goodyear, Rockwell Field, Cal., Jan. 15, 1918; Maurice F. Graham, Rockwell Field, Cal., Jan. 15, 1918; James E. Harrold, Rockwell Field, Cal., Jan. 15, 1918; Gordon L. Harwell, Ellington Field, Tex., Jan. 21, 1918; Arne K. B. Hoisholt, Rockwell Field, Cal., Jan. 15, 1918; Hubert S. James, Gerstner Field, La., Jan. 15, 1918; Clinton Jones, Rockwell Field, Cal., Jan. 15, 1918; William G. King, Kelly Field, Tex., Jan. 15, 1918; Russel H. Klyver, Gerstner Field, La., Jan. 15, 1918; William W. LaForce, Rockwell Field, Cal., Jan. 15, 1918; George Miller, Ellington Field, Tex., Jan. 21, 1918; Clifford C. Nutt, Ellington Field, Tex., Jan. 21, 1918; Hugh M. Rice, Ellington Field, Tex., Jan. 21, 1918; Jesse W. Simpson, Gerstner Field, La., Jan. 15, 1918; Vernon B. Travellyan, Gerstner Field, La., Jan. 15, 1918; Leslie W. Wishard, Ellington Field, Tex., Jan. 15, 1918; Jacob M. Woodward, Ellington Field, Tex., Jan. 21, 1918; Cameron Wirght, Kelly Field, Tex., Jan. 15, 1918.

To be First Lieutenant, Aviation Section, Signal Reserve Corps: Franklin O. Carroll, Kelly Field, Tex., Jan. 24, 1918.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: George W. Anderson, Taliaferro Field, Tex., Jan. 16, 1918; James F. Ashenden, Taliaferro Field, Tex., Jan. 18, 1918; Bryan M. Battey, Taliaferro Field, Tex., Jan. 12, 1918; Whitehurst M. Carner, Taliaferro Field, Tex., Jan. 16, 1918; Kenneth S. Clapp, Taliaferro Field, Tex., Jan. 12, 1918; Edwin R. Clark, Taliaferro Field, Tex., Jan. 16, 1918; Donald B. Cole, Taliaferro Field, Tex., Jan. 12, 1918; Irving P. Corse, Taliaferro Field, Tex., Jan. 12, 1918; George R. Cullman, Taliaferro Field, Tex., Jan. 12, 1918; Harold J. Forshay, Taliaferro Field, Tex., Jan. 16, 1918; Daniel B. Gish, Taliaferro Field, Tex., Jan. 25, 1918; John McArthur, Taliaferro Field, Tex., Jan. 16, 1918; William H. Plyler, Taliaferro Field, Tex., Jan. 16, 1918; Kenneth L. Porter, Taliaferro Field, Tex., Jan. 16, 1918; Joseph C. Raible, Jr., Taliaferro Field, Tex., Jan. 16, 1918; George A. S. Robertson, Taliaferro Field, Tex., Jan. 16, 1918; Raymond O. Seevers, Taliaferro Field, Tex., Jan. 16, 1918; William H. Shearman, Jr., Taliaferro Field, Tex., Jan. 12, 1918; Horace Shidler, Taliaferro Field, Tex., Jan. 12, 1918; Howard R. Smith, Taliaferro Field, Tex., Jan. 12, 1918; Henry Len. Stevens, Taliaferro Field, Tex., Jan. 22, 1918; George T. Wise, Taliaferro Field, Tex., Jan. 12, 1918; Lawrence T. Tyly, Taliaferro Field, Tex., Jan. 12, 1918.

February 4, 1918.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Waldemar H. Fries, Ft. Sill, Okla., Jan. 21, 1918; Russell G. Jones, Ellington Field, Tex., Jan. 17, 1918; Wallace A. Rowell, Kelly Field, Tex., Jan. 26, 1918.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Robert L. Davidson, Taliaferro Field, Tex., Jan. 16, 1918; Aubrey F. Diamond, Taliaferro Field, Tex., Jan. 16, 1918; William R. Dolphin, Taliaferro Field, Tex., Jan. 16, 1918; Lester H. Germer, Taliaferro Field, Tex., Jan. 16, 1918; Harold E. Goettler, Taliaferro Field, Tex., Jan. 12, 1918; Wallace B. Harwood, Kelly Field, Tex., Jan. 26, 1918; John C. Henderson, Taliaferro Field, Tex., Jan. 12, 1918; Harry H. Jackson, Jr., Taliaferro Field, Tex., Jan. 12, 1918; Joseph R. Kelley, Taliaferro Field, Tex., Jan. 12, 1918; William L. Lockhart, Taliaferro Field, Tex., Jan. 16, 1918; Donald H. Montgomery, Taliaferro Field, Tex., Jan. 16, 1918; John S. Owens, Taliaferro Field, Tex., Jan. 21, 1918.

February 5, 1918.

To be First Lieutenants, Aviation Section, Signal Reserve Corps: Joseph M. Dawson, Park Field, Tenn., Jan. 24, 1918; Jerry T. Illich, Ft. Sill, Okla., Jan. 19, 1918; J. Thad Johnson, Park Field, Tenn., Jan. 26, 1918; Harris C. Roberts, Kelly Field, Tex., Jan. 26, 1918; Thomas L. Rouse, Kelly Field, Tex., Jan. 25, 1918.

To be Second Lieutenants, Aviation Section, Signal Reserve Corps: Alfred A. Adams, Kelly Field, Tex., Jan. 25, 1918; George J. Brew, Taliaferro Field, Tex., Jan. 16, 1918; David D. Burton, Kelly Field, Tex. Jan. 25, 1918; Leslie G. Chandler, Kelly Field, Tex., Jan. 26, 1918; William N. Dewald, Kelly Field, Tex., Jan. 26, 1918; Olin C. Francis, Kelly Field, Tex., Jan. 25, 1918; Theophilus Lee, Jr., Kelly Field, Tex., Jan. 26, 1918.

Special Orders No. 21

First Lieut. Frank C. Lingenfelter, E. R. C., appointed first lieutenant, Aviation Section. Report to Vancouver Barracks.

First Lieuts. Joseph Seymour, Donald MacDonal, Louis Gordon Slutz and Brooke Edwards report aeronautical concentration camp, Garden City, Long Island.

Capt. Hugh J. Knerr, C. A. C.; Capt. Carlyle H. Wash, S. C.; Capt. Henry J. F. Miller, 23d Cavalry; Capt. George H. Peabody, 3d Cavalry; Capt. Dexter C. Rumsey, Cavalry, Detached Officers' List; First Lieut. Roy L. Noggle, A. S. S. C., and First Lieut. John N. Thorp, A. S. C., are rated as Junior Military Aviators.

Special Orders No. 22

Privates Rufus Boynton Rogers and Harold Willard Turner, S. E. R. C., appointed as second lieutenants, Aviation Section. Report to ground officers' training school, Kelly Field, San Antonio, Tex.

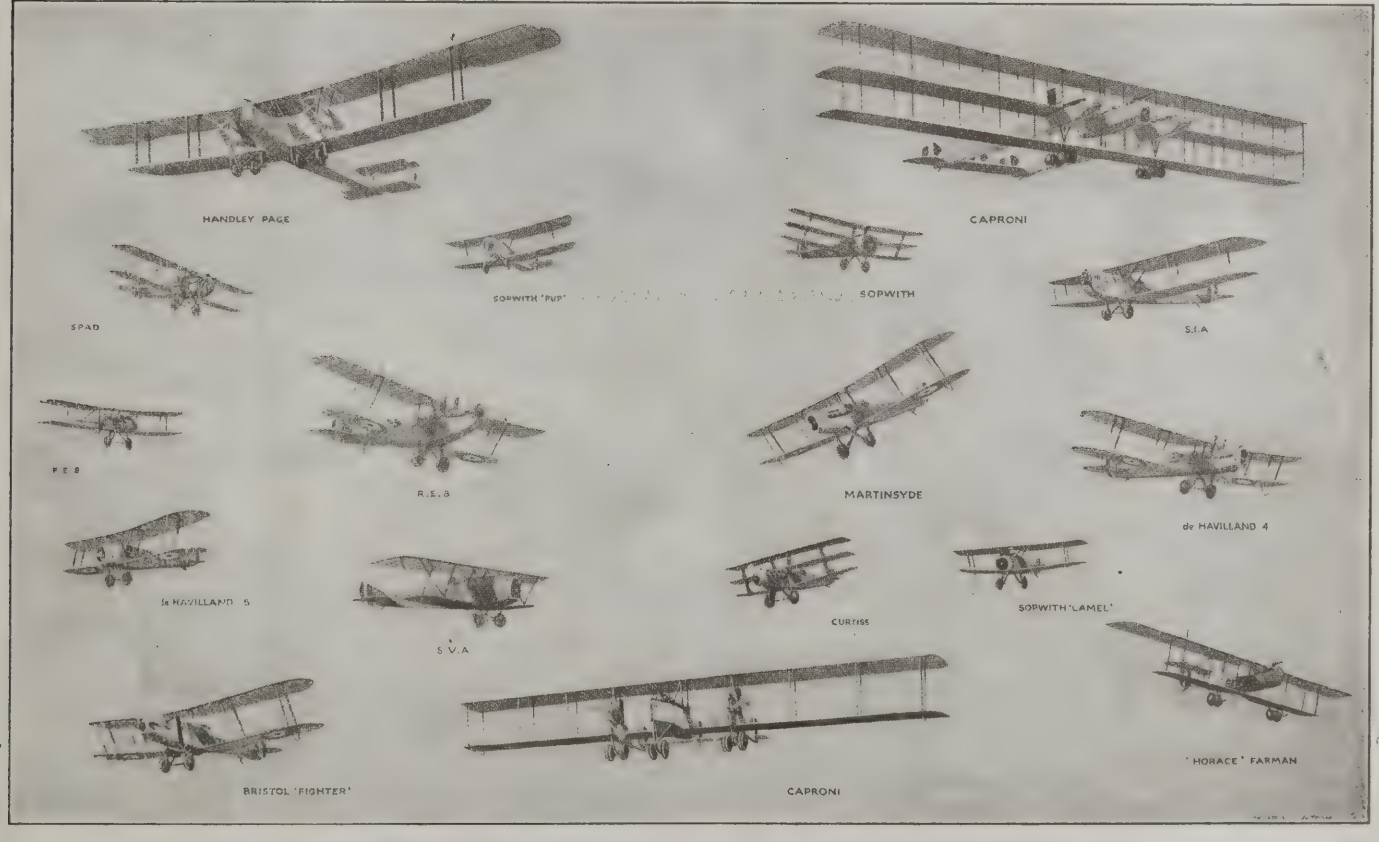
Lieut. Robert Neil Cowham report to Ellington Field, Houston, Tex.

Lieut. Col. Samuel M. De Loffre, U. S. A., retired, report to Chief Surgeon, A. S. S. C., Washington, D. C.

Maj. Henry C. K. Muflenberg, Maj. Bruce B. Buttler, Capt. Harry S. Gantz and Lieut. Walter F. Higbee on duty requiring regular flights.

Lieut. Earl Davis Seaverns report to Camp Hancock, Augusta, Ga.

Lieut. Max B. Rotholz, N. A., appointed second lieutenant, A. S. S. C. Report to Rich Field, Waco, Tex.



Representative German aeroplanes of 1917. From "The Aeroplane" (London)

Second Lieut. Henry A. Von Wedelstaedt report to Kelly Field, San Antonio, Tex.

Second Lieut. Joseph R. Darrac report to aviation concentration camp, Morrison, Va.

Second Lieut. Richard Donald Collins report to Gerstner Field, Lake Charles, La.

Second Lieut. Edward Everett White report at Wright-Martin Aircraft Corporation, New Brunswick, N. J., and wire Chief Signal Officer.

First Lieut. Wheeler E. Townley and Second Lieut. Ashby M. James report to Kelly Field, San Antonio, Tex.

First Lieut. Sull R. Cox and Second Lieut. Joseph R. Farabee report to Kelly Field, San Antonio, Tex.

Maj. George W. England, Infantry, report to Kelly Field, San Antonio, Tex., with temporary rank of lieutenant-colonel.

Capt. John William Good, N. A., appointed captain, A. S. S. C. Report to Rich Field, Waco, Tex.

First Lieut. C. W. Adams, Jr., appointed captain (temporary) in A. S. S. C.

First Lieut. Robert W. Dickenson, N. G., appointed first lieutenant, A. S. S. C.

First Lieut. Frederick S. Carpenter, O. R. C., appointed same grade, A. S. S. C.

Second Lieuts. Seaton G. Farris, Q. M. C., and Howard B. Hull, I. R. C., appointed same grades, A. S. S. C.

Special Orders No. 23

First Lieut. Robert D. Taylor report to School of Military Aeronautics, Ohio State University, Columbus, O.

Sergt. Jacob S. Sides, S. E. R. C., appointed first lieutenant. Report to Colonel Bull, Air Personnel Division, Washington.

Frederick Howard Randall appointed captain. Report to School of Military Aaronautics, Ohio State University, Columbus, O.

Gilbert Ray Eichelberger appointed second lieutenant. Report to aviation general supply depot, Dayton, O.

Sergt. Henry Johnson Foster, N. A., appointed second lieutenant. Report to Chief Signal Officer.

Nolan Dickson Mitchell appointed first lieutenant. Report to aviation concentration camp, Morrison, Va.

Private John Bernard Slimm appointed first lieutenant. Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.

Private Hally Mering Scott, N. A., appointed second lieutenant. Report to the Chief Signal Officer.

Victor Hendricks Henderson appointed captain. Report to the Chief Signal Officer.

Second Lieut. William F. Lake report to the Chief Signal Officer.

First Lieut. Hugh M. Lumsden report to Hazelhurst Field, Mineola, Long Island, N. Y.

Second Lieut. Malcolm M. Gray report to the Chief Signal Officer.

Maj. Robert A. Milliken promoted to temporary grade of lieutenant-colonel.

Second Lieut. Claud E. Aikman, F. A. R. C., appointed first lieutenant, A. S. S. C. Report to Post Field, Fort Sill, Okla.

Second Lieut. Peirce Van Vleck, E. R. C., appointed second lieutenant, A. S. S. C. Report to the Chief Signal Officer.

Capt. George Peabody report to Chief Siganl Officer, revoking previous order to report to Houston, Tex.

Capt. Arthur R. Jones report to School of Military Aeronautics, University of Texas, Austin, Tex.

Second Lieut. Bertram E. Giesecke, E. R. C., appointed second lieutenant, A. S. S. C. Report to School of Military Aeronautics, University of Texas, Austin, Tex.

Second Lieut. Frank Andrew Witt, N. A., appointed first lieutenant, A. S. S. C. Report to the Chief Signal Officer.

First Lieut. Jesse C. Edwards, M. R. C., proceed to School of Military Aeronautics, University of California, Berkeley, Cal.

Special Orders No. 24

Adolph Stuber appointed first lieutenant. Report to the Chief Signal Officer.

Private Golden H. Benefiel, S. E. R. C., appointed first lieutenant, Chanute Field, Rantoul, Ill.

Lewis Peniston Kinsey appointed second lieutenant. Report to the Chief Signal Officer.

Frank Graham appointed second lieutenant. Report to Vancouver Barracks, Washington, for duty in spruce production division.

Henry Leighton Bangs appointed second lieutenant. Report to the Chief Signal Officer.

Edward Stanley Clark appointed second lieutenant. Report to Signal Corps Aviation School, Mineola, Long Island, N. Y.

Guy E. Logan appointed major. Report to Rich Field, Waco, Tex.

Harry E. Williams appointed first lieutenant. Report to Camp Sevier, Greenville, S. C.

Second Lieut. Clinton F. Woolsey, F. A. R. C., report to School of Military Aeronautics, University of Texas, Austin, Tex., for training.

First Lieut. John O. Vines, 166th Depot Brigade, report to School of Military Aeronautics, Austin, Tex.

Second Lieut. Calvin S. Hain, C. R. C., report to School of Military Aeronautics, University of Texas, Austin, Tex.

Maj. Herbert A. Dargue rated as Junior Military Aviator.

Second Lieut. Robert S. Downing report to aviation examining board at Kansas City, Mo.

Special Orders No. 25

Thomas Hubbard McHatton appointed captain. Report to the Chief Signal Officer.

Joseph Byron Plush appointed second lieutenant. Report to the Chief Signal Officer.

William Jucien Carbine appointed captain. Report to Camp Sevier, Greenville, S. C.

David Graham Ong appointed first lieutenant. Report to the Chief Signal Officer.

Robert Lloyd Chamberlaine appointed captain. Report to the Chief Signal Officer.

Edwin Page Webb appointed captain. Report to general supply depot, Indianapolis, Ind.

Private Hudson Coe Burr appointed second lieutenant. Report to School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

Stanley Dinsmore Livingston appointed first lieutenant. Report to the Chief Signal Officer.

Second Lieut. Edward D. Watson, Jr., I. R. C., report to School of Military Aeronautics, University of Texas, Austin, Tex., for training.

Private James T. Leidigh appointed second lieutenant. Report to Rockwell Field, San Diego, Cal.

Calvin Edward Davis appointed second lieutenant. Report to School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

Henry Frederick Laurtsen Millstrey appointed second lieutenant. Report to the Chief Signal Officer.

John Jerome Marquette appointed captain. Report to School of Military Aeronautics, Ohio State University, Columbus, O.

Second Lieut. Harold B. Shadle report to Col. B. P. Disque, Yeon Bldg., Portland, Ore.

Edwin B. Lausier appointed captain. Report to the Chief Signal Officer.

William Henderson Rust appointed second lieutenant. Report to the Chief Signal Officer.

Tasso Vance Orr appointed first lieutenant. Report to School of Military Aeronautics, Georgia School of Technology, Atlanta, Ga.

John Joseph Meade appointed first lieutenant. Report to Pittsburgh, Pa., and report by wire to Chief Signal Officer.

William Dayton Rogers appointed first lieutenant. Report to the Chief Signal Officer.

Charles Harper Smith appointed first lieutenant. Report to the Chief Signal Officer.

Edwin Foster Kingsbury appointed first lieutenant. Report to the Chief Signal Officer.

First Lieut. Charles H. Fiske, Jr., report to the Chief Signal Officer.

First Lieut. Paul R. Turpin transferred to Aviation Section, Signal Corps.

Second Lieut. Seaton G. Fariss report to School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

First Lieut. Lawrence C. Mann required to participate regularly in aerial flights.

James Harold Wolfe appointed first lieutenant. Report to School of Military Aeronautics, Ohio State University, Columbus, O.

Lieut.-Col. Bane on Joint Army-Navy Aircraft Board

Lieut.-Col. Thurman H. Bane, Signal Corps, is appointed a member of the Joint Army and Navy Technical Aircraft Board.

Personal Paragraph

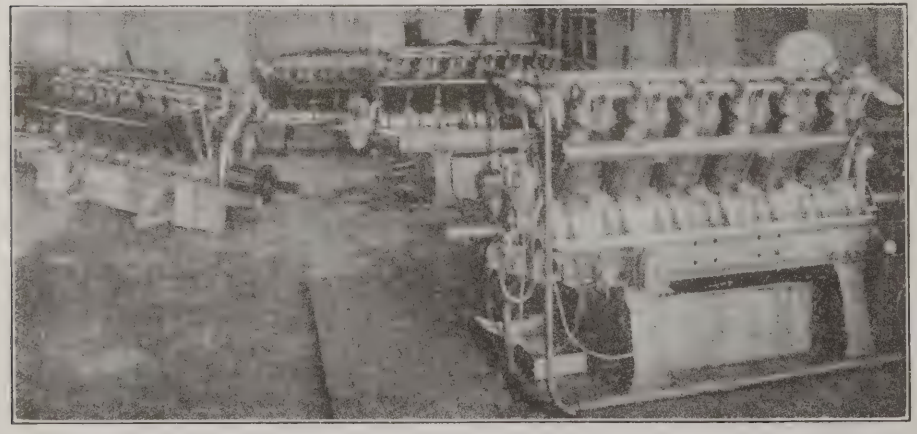
Ollie E. Haupt, of the Ollie E. Haupt Motor Co., St. Louis, Mo., has enlisted as an officer in the Aviation Corps, San Antonio, Tex.

Air Fighting in December

Two hundred and fifty aeroplanes—British, French and German—were officially reported down during December, says the Times, in its excellent monthly summary. Eighteen of these, Germans, were brought to earth by British pilots on the last day of November. Deducting these, and making allowance for possible duplications in any of the official reports, the number brought down actually within the month was 232.

In November the total was 370. Of the December total the Allies claim 171 and the Germans 61.

Perhaps the most interesting feature of the month's aerial warfare on the British front is the number of German aeroplanes which have been brought down in our lines by both pilots and gunners. Twenty have thus fallen—seven to anti-aircraft guns, twelve in flights, and one which landed, probably owing to engine defect,



Shipment of Green engines ready for delivery for R. N. A. S. aeroplanes. (British Official Photo)



Making aeroplane wings for military aircraft. Very expert "tailoring" is required in order that wings may withstand strains imposed on them. Applying the "dope" which makes the wing air-tight. (© Committee on Public Information)

and was captured by us intact. These figures give point to Sir Douglas Haig's not infrequent remark that the enemy's machines were, on this or that day, "more" enterprising" or "more aggressive" than usual, and indicate the price they have been made to pay for their excursions in a westward direction.

One hundred and one German machines have been brought down by our men—78 on the battlefront and 23 by the R. N. A. S., operating under the orders of the Admiralty. The naval airmen have again a distinguished record. In October they destroyed or drove down out of control 24 machines, with a loss to themselves of four machines, and in November the corresponding figures were 18 to 0. Last month they destroyed 12 and drove down out of control 11 (and of these it is claimed that three were probably destroyed), and lost only one machine themselves. Of the 78 German aeroplanes accounted for on the battlefront, exactly half were destroyed in fights, 28 were driven down out of control, 10 fell to the guns, and one was forced to land. Our loss, as reported by General Headquarters in France, was 36 machines, one of which failed to return from the raid on Mannheim.

French airmen and gunners accounted for 69 enemy machines—40 destroyed and 16 driven down damaged in fights, seven brought down by the gunners, and six forced to land. One machine was brought down during the month by a Belgian airman.

Flying Below the Sea

British aeroplanes, when bombarding Turkish sheds on the Dead Sea, were flying 400 feet below sea level. This fact appears strange, but it must be remembered that the Dead Sea is 1,292 feet below the Mediterranan Sea.

Germans Claim World's Record

A rival performance for the London to Constantinople flight has received publicity throughout the German press. It is announced that Flight Captain Hans Hesse accomplished a journey from Berlin to Mosul, the junction of the Tigris to the north of Bagdad, which has recently been threatened by British attacks. The distance, which is 2,000 miles more or less, "a ten-day railway journey," is said to have been covered in "34 hours of flight."

Detroit Men Show Physical Fitness

A high percentage of applicants from Detroit are qualifying in the air service. Captain W. R. Wren, president of the U. S. Aviation Board at Washington, D. C., has just completed several days of investigation. It was found that while in other cities one out of every ten qualifies for this service, the high skilled mechanics from the Detroit district are qualifying at the rate of nine out of every ten. There are 450 men being recruited from Detroit and vicinity to act as engineers in the non-flying section of the Aviation Corps. Most of these have been sent to the Massachusetts Institute of Technology for seven weeks' intensive training.

Considering Establishment of Aviation Field

The War Department is considering the establishment of a site at Selma, Ala., for an aviation training camp.

MAGNETO vs BATTERY IGNITION

By J. B. WILLIAMS

President and Chief Electrical Engineer of the K. W. Ignition Co.

THE natural evolution of ignition in internal combustion engines from the hot tube to battery systems, then to the low tension magneto and finally to the independent high tension type of magneto, was accomplished through innumerable series of tests, during the days of automobile motor development. These tests had brought out the fact that the high tension magneto gave best results under any and all conditions, causing the high tension magneto to be universally recognized as the standard.

In accordance with the title of this paper, I have endeavored to treat both systems of ignition fairly and absolutely impartially, from a scientific and technical standpoint. We begin with the principles of battery ignition and discuss the battery ignition system, and then in the light of these diagrams and explanations, we follow with a description of high tension magneto ignition. We then give a comparison between the two types of ignition, concluding the paper by illustrating diagrammatically how and why a hot spark causes the engine to produce more power and economize greatly on fuel consumption.

Before proceeding with the subject, it might be well to explain to you how a coil of wire is made to generate electricity.

The only known way to generate electricity with a coil of wire, is to create lines of magnetic force within its axis; or to remove magnetic lines of force from its axis, by decreasing the amount of lines of force, or better still by reversing their polarity or direction of flow.

The greater the amount or number of lines of forces your coil or wire surrounds, and the faster you can effect a rate of change in the quantity of them, the more voltage you will generate within your coil of wire.

It does not make any difference whether your coil of wire should be a spark coil, a dynamo, a magneto, or any other piece of electrical apparatus, this method of fluctuating the amount or reversing the direction of lines of force, is the only known method of creating voltage or electrical pressure by means of the use of coils of wire.

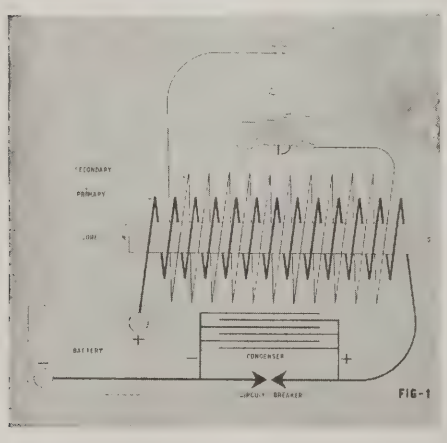


FIG-1

The volt is the unit of measurement of electrical pressure, just as is the pound the unit of measure of steam or water pressure.

The ampere of current is the unit of measure of volume, just as is the gallon or cubic foot a unit of measure for fluids.

The ohm is the unit of resistance which opposes the flow of electricity.

We will now call your attention to figure 1, an outline view, and figure 2, a sectional view of a battery ignition system.

These views illustrate and show all of the functional parts, not only of one battery ignition system, but of all of them, irrespective of their different arrangement of parts or outward appearance.

In the spark coil there is a central core of soft iron wire, which is surrounded by, or wound with, from 150 to 300 turns of insulated copper wire of comparatively large size and low resistance, and called the "primary winding."

Outside of, and surrounding this primary winding there is another winding which consists of a large number of turns of very fine copper wire, usually from 20,000 to 30,000 turns, called the "secondary winding," one end of which is connected either directly or indirectly to the frame work of the engine, and the other end of which is connected to the terminal of the spark plug.

Referring again to this primary winding, it has of course a switch in circuit, located at some convenient place not shown in the diagram, for turning the ignition on and off by opening or closing the primary circuit.

It also has a circuit-breaker or interrupter,

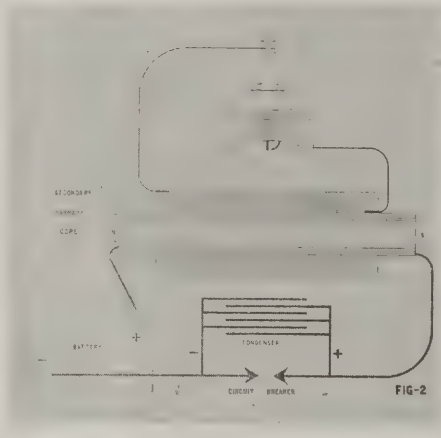


FIG-2

as designated by the arrow heads in the diagram. This circuit-breaker or interrupter is magnetically operated on the ordinary vibrating coil and is mechanically operated on other types of battery ignition systems.

Connected to each terminal of this circuit-breaker, is a condenser composed of several sheets of tinfoil.

The even numbered sheets are connected to one terminal of the condenser and the odd numbered sheets to the other terminal. These sheets of tinfoil are separated and insulated from each other either by means of mica sheets or specially prepared paper.

There is in every ignition system two kinds of condensers, a good condenser and a bad condenser; the good condenser does the thing we want it to do, and is connected across the terminals of the circuit-breaker or interrupter. The bad condenser does the thing we do not want it to do, and locates itself within the secondary winding of the coil, and is technically called static capacity of the secondary winding.

Inefficient ignition systems have a very large bad condenser, or a great deal of static capacity in the secondary winding. Good ignition systems have a very small bad condenser, and consequently very much less capacity in the secondary winding.

Having shown the various parts of a battery ignition system, we will discuss the function of the separate parts.

The storage battery simply acts as a source of current.

The iron wire core serves to concentrate and direct the magnetic lines of force that the current circulating through the primary winding creates.

The function of the primary winding is to form a path for the electric current; so that it can circulate many times around the iron wire core and thus produce the magnetic lines of force in the core.

The function of the secondary winding is to generate a very high voltage anywhere from 20,000 to 30 000 volts, so that we will have sufficient voltage or pressure to jump the gap in the spark plug and carry whatever amperage of current the coil delivers.

The function of the circuit-breaker, or interrupter, is to break the circuit and interrupt the flow of current, when the current circulating around the core has reached its predetermined or ultimate value.

We now come to the function of the good condenser. Its purpose is to absorb the current that forms an arc across the gap between the circuit-breaker points when they separate. It is surprising what a large amount of current in amperes or volume a small condenser will absorb.

The capacity of all condensers depends upon two things; first, the area of metallic surfaces opposed to each other; second, the nearness together of those surfaces. In other words, the larger the surfaces involved and the closer together they are, the greater the capacity of the condenser to absorb current.

It is very important in any ignition system to have a condenser of just the right capacity to absorb the current and stop the sparking at the points of the circuit-breaker. The points, however, must be allowed to spark a little, just enough to keep themselves burnt clean.

The function of a spark plug is simply to create a gap in the cylinder of the engine for the spark to occur in which gap should be of the proper width to absorb the maximum energy that the ignition system will produce.

It might be well at this time to explain the function of what we call the bad condenser, the condenser we do not want—but which insists on being present, to a greater or less extent, in every ignition system, no matter how unwelcome it is. When designing an ignition system we must cut down this bad condenser to its smallest possible capacity to do harm.

This bad condenser is located along every inch of wire that the secondary winding has in it. The longer the wire in the secondary winding, and the more turns it has, the greater the capacity of this bad condenser.

The harm that this bad condenser does is to absorb the amperes of current, thus robbing the spark plug and preventing the spark from being as hot as we would like to see it.

To further illustrate the action of this bad condenser or the static capacity of the secondary winding, we will refer you to figure 3. We show here three different lengths of water pipe, connected at one end to a larger pipe, which is kept full of water.

These pipes all have the same size holes drilled in them, and the same number of holes per inch length of pipe, thus creating leaks whereby the water gets away instead of running through the pipe.

You will not that very little water comes out of the end of the longest pipe. Nearly all of it leaks away through the small holes drilled along the length of the pipe; also that a greater quantity of water flows out of the end of the next longest pipe and the shortest length of pipe has the greatest quantity of water flowing out of its end.

Now just imagine that these pipes are the secondary windings of different types of ignition system, and that the end of the pipe is the spark plug gap, and the amount of water flowing out of the end of the pipe is the amount of amperes of current flowing across the spark plug gap, generating the heat of the spark. The water leaking out of the small holes drilled in the pipe, represents the amperes of current that is being absorbed or wasted by the bad condenser, or static capacity of the secondary winding.

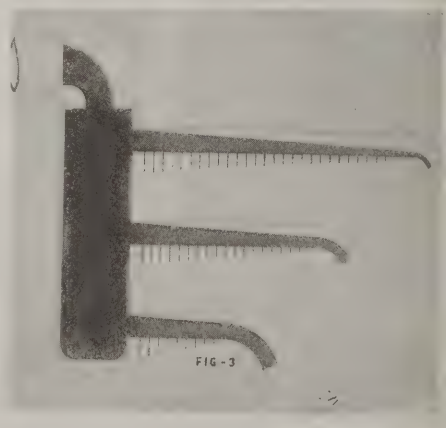
You will then realize how the secondary winding of an ignition system forms itself into a condenser and wastes the current which we ought to have, and would like to get at the spark plug gap for ignition purpose. The shorter we can have this secondary winding and still generate the required voltage to jump the spark plug gap, the more current we will have left to create heat in the spark.

You may compare with truth and accuracy these different lengths of water pipe shown in Figure 3, with three different types of ignition systems as follows: The longest pipe to a battery ignition system—The next longest pipe to the old style or H armature type of high tension magneto—The shortest pipe to the most efficient design of high tension magneto.

In briefly following up the operation of a spark coil, when the circuit-breaker closes, current flows around the turns of the primary winding, creating and building up lines of magnetic force in the iron wire core. The next step is to have the circuit breaker points open, causing the current which build up and supports the lines of force, to cease flowing. The lines of force in the core of the coil no longer being maintained by the flow of current, fall or disappear. They fall, however, in a much smaller period of time than it takes to create them. As previously explained, by disappearing they create electrical pressure or voltage in the turns of the secondary winding. This cycle of operation is repeated every time the circuit-breaker points close and open.

The action of a battery ignition system is just like lifting up a hammer and letting it fall on a nail. The only force which you have to apply to the nail, is the power that the hammer exerts through its weight in falling. This is rather an inefficient way to drive a nail, is it not?

We have no means in a battery ignition system to handle the lines of magnetic force any


FIG-3

more energetically than to just let them fall, as the hammer falls on the nail.

The height which you raise the hammer can be compared to the volume or number of lines of magnetic force which you have built up or created in the iron wire core; and their speed of disappearance compared to the force of gravitation which brings the hammer down.

We have already shown the manner in which electricity is created by means of a coil of wire, either by increasing or decreasing the amount of magnetic lines of force that the coil of wire surrounds.

Now the amount of electrical energy produced depends upon two things: first, upon the number or volume of lines of magnetic force that you are dealing with; second, upon the rapidity or speed of change that you can effect in their amount or direction of flow.

You will note that half of the magnetic circuit of a spark coil is the air. The lines of force produced in the core of the coil have to travel from one end of the core to the other, through the air.

Now as air offers something like 280 times the resistance to the flow of magnetism as does iron, you see that a battery ignition coil has a very inefficient magnetic circuit, requiring a very strong current of electricity circulating around the iron wire core in order to produce a very few lines of magnetic force.

The question might be raised as to why it would not be good construction to lengthen the iron wire core and join its two ends together, making a ring of it so that it would have a path of very high magnetic conductivity so that a very small amount of electrical energy could thus produce a very large amount of magnetic lines of force. The reply to this question would be that it would then take a very long time for the electric current to rise to its full value, owing to the largely increased induction in the coil. Furthermore, after having raised the magnetism to the highest obtainable point, on breaking the circuit it would collapse or disappear very slowly, for as lines of force are generated in the core of the coil, by their very generation they create an opposing voltage which tends to oppose the voltage of the battery current and prevent its rapid rise to its maximum.

Spark coils for battery ignition systems have to be made with straight iron wire cores, in order to secure sufficient rapidity of action, consequently they must of necessity have a very inefficient magnetic circuit.

Now if by any means we could double the rapidity with which we vary the amount of these lines of force; or if we could by any means double the quantity of lines of force, we would then be able to get along with half as many turns of wire on the secondary winding.

The effect of this shortening up of the length of the wire in the secondary winding would mean cutting in half the static capacity or absorbtion of current by the secondary winding, and consequently double the amount of amperes delivered at the spark plug points without decreasing the voltage.

You see the more volts that we can make one turn of secondary winding produce, the less surface we expose to absorption of the current produced; and the larger the output of energy we get at the spark plug points.

In a battery ignition system, on account of the limitations imposed by the speed of operation, we are compelled to use an inefficient magnetic circuit which generates a comparatively low voltage per turn of secondary winding; necessitating the use of a very large number of turns and the exposure of a large surface to the absorption of current through static capacity, resulting in the production of the skeleton of a spark at the spark plug points and the leaving of the meat of the spark or amperes absorbed in the secondary winding.

In summing up the principles involved in battery ignition systems; we find inherent faults as follows: first, they do not and cannot create enough lines of magnetic force; second, they do not and cannot handle the few lines of magnetic force they do create, with sufficient energy or speed. In consequence of these two faults they

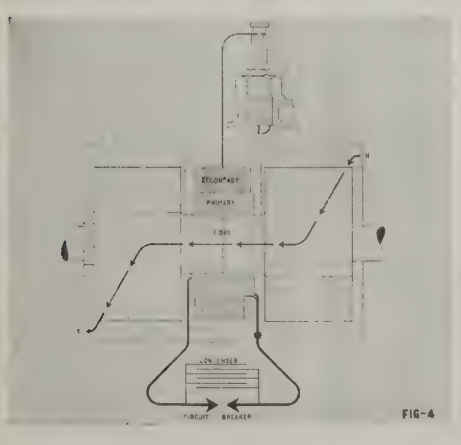


FIG-4

cannot generate sufficient voltage per turn of secondary winding.

Inasmuch as a low tension magneto simply acts as a source of current and a circuit-breaker and has to use the same kind of a spark coil as a battery ignition system has, it does not produce a much better spark, except that it is a much more reliable source of current.

Now if we can design an ignition system having nearly all of its magnetic circuit composed of soft iron or steel, this will give us a very efficient magnetic circuit, permitting us to

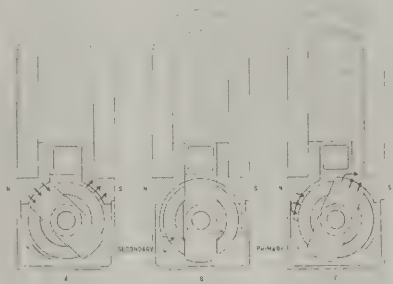


FIG-5

generate and handle a very large number of lines of magnetic force. We must, however, have means for causing the rapid disappearance or reversal of these lines of force.

Let us now look into the principles employed in the high tension magneto, and we will see whether or not that device remedies any of the defects existing in the spark coil of a battery ignition system.

Figure 4 is an illustration of the working principle of a modern high tension magneto. We have a soft iron core, a primary winding surrounding it, a secondary winding outside of the primary winding, a circuit-breaker and a condenser. We have every functional part of a battery ignition spark coil.

Instead of a storage battery, however, we have permanent magnets. The permanent magnets in this view are not shown, as we are looking up from the bottom of the magneto to get a better view of the windings and core.

You will note that the core of the armature, which is the core of the winding, is round and short and stubby. It has two extensions on each end to conduct the magnetism, or lines of force, from the pole pieces of the permanent magnets to the core of the winding, through the core of the winding and out at the opposite pole.

This core of the winding is located in the direct path of flow of the great number of lines of force from the permanent magnets, and being made of the softest iron, it forms a good conductor; thus concentrating all the lines of force of the permanent magnets and conducting them to the center or axis of the winding.

You will further note that the secondary winding is very short for a large number of turns and a great length of wire are not necessary in this design.

The pole pieces on this magneto, instead of being set directly opposite each other, have their centers spaced 90 degrees apart. The extensions of the armature core or rotor are also set 90 degrees apart, so as to conform to the location of the pole pieces of the permanent magnet, thus giving the shortest possible path for the magnetic lines of force to go from pole-piece to pole-piece, and at the same time making all of them pass through the center or axis of the winding.

Be referring to Figure 5, (which is an end view of the small magneto) you will note that the air gap in circuit is just as small or short as will permit of a safe running clearance of the rotor or core extensions.

In comparing Figures 4 and 5 to the construction of the spark coil of a battery ignition system, you will see that we have enormously shortened the core of the coil, and in addition thereto have almost entirely eliminated the long high resistance air path of the battery spark coil, thus providing an easy path for a very large number of magnetic lines of force to flow through.

Now let us see how we can compel the rapid disappearance of this large body or number of lines of force, by reversal of polarity, thus not only handling a very greatly increased number of lines of force, but also handling them at least twice as energetically as could be done with the battery ignition coil.

Position "A" of diagram 5 shows the rotor or core at rest. The magnetic lines of force are coming down through the wing of the rotor nearest to us and are passing centrally through the round core and round winding and are going up the core extension on the other side of the winding to the opposite pole of the permanent magnet. In position "B" the armature is shown in a different position as it is being rotated to the position "C." Position "C" shows the rotor in position that it occupies during the time that a spark is being delivered to the spark plug. We will now see that the arrows are going into the core on the opposite or further side of the winding and are going through the core and passing out on this side of the winding, showing that we have a complete reversal of polarity through the winding.

Now in summing the whole matter up in a few words, we find that a modern high tension magneto corrects all of the inherent defects in a battery ignition system. It handles a very much larger number of lines by force, accelerating their rate of change by reversal of polarity, thus handling them far more energetically.

This is doing just the thing which we have previously noted will cause the generation of a higher voltage per turn in the secondary winding, thus permitting the use of a secondary winding of very much shorter length; consequently exposing much less surface of wire to the action of absorption of current by static capacity, cutting down the opportunity of the so called "bad condenser" to rob the spark plug gap of the current necessary to give it the greatest heat of spark.

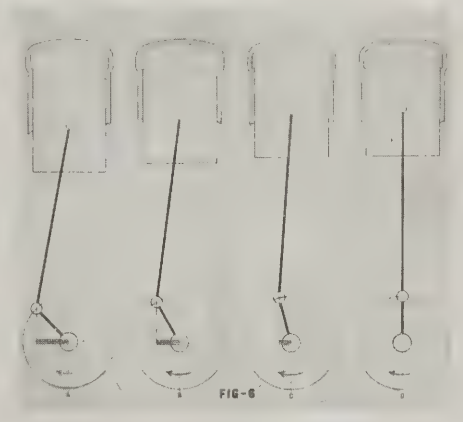
Referring to this hammer and nail illustration with this high tension magneto, we can now raise the hammer to a very much greater height and we can slam it down with a great deal more force, thus driving our nail efficiently and quickly.

Having shown why a battery ignition system produces a weak spark, and a high tension magneto system produces a hot spark, it remains to be shown how and why a hot spark will cause an engine to produce more power with less fuel consumption than a weak spark.

There has always been a great deal of difference of opinion among engineers as to whether a hot spark is any better than a weak spark. Some of them seem to think that a spark is a spark, and so long as it does not make a missed explosion, you are getting all out of it that is possible.

Nothing is further from the truth than that assumption. In practice we find that the weaker the spark is, the slower the propagation of flame in the mixture, necessitating a much greater advance to the spark.

Practice further shows that the hotter we can have our spark the less early we have to make it occur in advance of dead center, for there is a direct relation between the heat of the spark


FIG-6

and the speed of flame propagation in the mixture.

Figure 6 is a diagrammatic view of an engine cylinder, piston, connecting rod and crank-throw, showing four different positions.

The sparking is supposed to be occurring in these different positions. Position "A" shows the spark advanced further than in any other diagram. This position represents the engine firing with a weak or battery ignition spark.

Note the shaded area projected down from the center of the crank shaft. This represents minus torque, or that power which is using up fuel in an effort to run the engine backwards.

Position "B" represents the engine firing with a still hotter spark, and consequently with less spark advance needed. You will note that the minus torque arm is now shorter, showing less fuel burned and less power expended in the minus direction.

Position "C" shows the engine in operation with a hot, powerful high tension magneto spark, which is occurring still nearer dead center, wasting less fuel, generating more power in the forward or plus direction, and burning less fuel and exerting less power in the minus direction.

Position "D" represents the ideal condition, which we have not yet attained, but will attain just as soon as we can create ignition sparks as hot as they should be. If we can get an ignition spark hot enough and large enough, we can make the propagation of flame through the mixture so fast that we will not have to begin to ignite the mixture a long way ahead of dead center as we do now, with the weakest sparks.

Do you imagine that a steam engineer for one

(*Continued on page* 1025)

STABILITY IN GENERAL*

By HARLAN D. FOWLER, Aeronautical Engineer

PART IV.

Stability as Determined by Laboratory Tests for Aeroplanes and Seaplanes

(*Concluded from page* 891)

HAVING now explained the effect of forces acting on aircraft and the proper positioning of their points of application which will lead towards the successful design of a stable machine, and which when constructed in model form will be tested in a wind tunnel. This will enable a more correct and reliable set of data to be brought out, and if any correction in the general design is necessary it can easily be remedied without excessive cost and time.

The model should be very rigidly and accurately constructed and highly finished. An accuracy of .01 of an inch is the general requirement. The weight of the model does not enter into laboratory tests, and therefore may be strongly constructed.

In model testing the lift and drift components are measured in pound units, and the moments taken about the *C.G.* measured in pounds-inches units, and are tested for various speeds. The conversion of these values from a model to a full size machine must be made before they can be applied to further calculations.

Let V_m = velocity of the wind in the wind tunnel on the model in miles per hour, V = velocity of the aeroplane in the air in miles per hour, R = ratio of the full size machine to that of the model, therefore,

Force on aeroplane or dirigible = Force on model ×

$$\left(\frac{V}{V_m}\right)^2 \times R^2 \quad (12)$$

$$\text{Moment on aeroplane or dirigible} = \frac{\text{Moment on model}}{12} \times \left(\frac{V}{V_m}\right)^2 \times R^3 \quad (13)$$

In Fig. 28 is a typical test chart showing the pitching moments exerted on the complete model aeroplane. If it is desired to balance the machine at an angle of incidence of 2° the *C.G.* should be located at some point on the vector for 2°.

Note in the figure that for angles greater than 2°, the vectors pass to the rear of the *C.G.* indicating diving moments. Thus the machine is in stable equilibrium at 2°, and if deviated from this angle, righting moments are at once created which tend to restore the normal altitude. This is termed "inherent stability" and depends wholly on the location of the *C.G.* and setting of the stabilizer. The pitching takes place about the *C.G.*

Beyond that of the righting moments (statical stability of the machine) there is the damping (dynamical stability) due to the horizontal stabilizer, elevator, flaps, body, and all parts forward and aft of the *C.G.* The damping is increased by a large tail, a long body and high speed.

The damping of a surface depends on the area of the surface, the moment arm of that surface, the linear velocity with which it swings through the air (which varies also as the moment arm) and with the velocity of advance.

Steadiness in flight may better be obtained by large damping factors than by strong righting moments. Excessive statical stability tends to make the machine "take charge" and take a preferred attitude relative to the wind at a time when such a maneuver may embarrass the pilot, as when approaching a landing.

The followings are values of pitching moments in lbs.-inches for the machine in Fig. 28 for various angles of incidence and at a speed of 30 m.h.p.

—1°	+.15	6°	—.16
0°	+.12	8°	—.25
+1°	+.06	10°	—.31
2°	—.01	12°	—.35
4°	—.09	14°	—.46

For a machine 20 times the size of the model, the speed is 60 m.p.h. at an angle of incidence of 6°. What force will the elevator have to exert to keep the aeroplane flying at this angle if the center of pressure of the elevator is 20 feet from the *C.G.*?

The pitching moment at 6° is —.16 lbs.-in. for the model, or $\frac{-.16}{12} \times \left(\frac{60}{30}\right)^2 \times 20^3 = -427$ lbs.-ft. for the full size machine. The force necessary to be exerted by the elevator is $\frac{-427}{20} = -21.3$ lbs. The minus sign indicates a negative angle of incidence of the elevator to the wind.

All aeroplanes and seaplanes of normal type are probably longitudinally stable at high speeds but lose this stability for all speeds below a certain critical speed, which generally occurs from 35 to 45 m.p.h. This is one factor which retaliates against the much desired slow speed of an aeroplane.

Sometimes it is desired to convert an aeroplane into a seaplane, in which case pontoons are substituted for the wheels. In doing this great care should be taken in regard to making the proper alteration for keeping the machine in a stable condition. Increasing or decreasing the angle of the horizontal stabilizer will assist greatly in maintaining the original stability.

Lateral stability is treated in the same way. In connection with lateral motion, however, there are three elements which act when the aeroplane is yawed to the right or left of its course. These are (1) the lateral force Y at right angle to the longitudinal axis, (2) a rolling moment L tending to roll the aeroplane about the longitudinal axis, and (3) a yawing moment N tending to yaw the machine about the vertical axis.

Fig. 29 represents a typical chart for lateral stability. The subscript after each letter represents the angle of incidence, and therefore the speed, at which the aeroplane travels. The curves of N show that, if this machine yaw to the right, a negative yawing moment is produced which tends to turn the aeroplane to the left, and hence to put it back on its course. The aeroplane is "directionally" stable, having a preponderance of fin surface behind the *C.G.* and the pilot need not use his rudder to stop the yaw. For a neutral aeroplane, if it desired to yaw 15° for a turn it will be necessary for the pilot to exert sufficient force to overcome a moment of

$$\frac{-.221}{12} \times \left(\frac{90}{30}\right)^2 \times 20^3 = -1{,}320 \text{ ft. lbs.}$$

A bank proper to a right turn requires a positive angle of roll given by a positive rolling moment. The curves of L in the figures show that for the machine under consideration the natural rolling or banking moments are positive for a positive yaw, and hence tend to bank the areoplane suitably for the turn. This property is extremely valuable in preventing capsizing. Large banking moments can be given by vertical fin surfaces above the *C.G.*, by a dihedral angle or a sweep-back of the wings. All these arrangements are probably equivalents and, though tending to give a stable motion in still air, tend toward violence in gusty air.

Suppose a plus yaw of 20° in still air. The rolling moment at high speed is $\frac{.55}{12} \times \left(\frac{90}{30}\right)^2 \times 20^3 = 3{,}300$ ft.-lbs. This requires an up load of 87.5 lbs. on the right aileron and a down load of 87.5 lbs. on the left aileron, where the center of the aileron from the *C.G.* is 20 ft.

When approaching a landing it is most important that the aileron control shall be very powerful compared with the natural banking tendency. In any aeroplane design, the relative magnitude of the natural rolling moment and the aileron control available should be carefully considered.

The curves for lateral force Y are negative for a positive yaw. This means, that if the apparent wind shifts 10° to the left the lateral force pushes the areoplane to the right and started off on a right turn. A side-slip to the left is equivalent aerodynamically to a positive or right hand yaw. The sign of the lateral force Y is negative for a plus yaw and hence resists the side-slip, as is desired.

When a gust of wind strikes an aeroplane from the left, thus causing a positive angle of yaw (refer to Fig. 1), the left wing immediately tends to rise. Owing to the momentum of the machine the *C.G.* continue to its course, thus producing a side-slip. But, in this case, the lateral force comes into play, due to the side area of the body, wings, etc., and pushes the entire aeroplane to the right, thus preventing side slip. While these changes are taking place the yawing moment is causing the machine to assume its original course. The result is that after considerable numerous quick maneuvers, hardly preceptible to the pilot in an ordinary wing gust of low velocity, the areoplane assumes its course. In fact, throughout the whole flight, the machine is continually being buffeted about.

It is not advantageous for any of the corrective factors to be of a strong magnitude, as they may at times take entire control, which at some critical moment may prove destructive.

For Kite-Balloons and Dirigibles

An elongated ellipsoid has three positions of equilibrium in a wind corresponding to the directions of the three axes. Only one position is stable, however, and the body tends to place itself broadside to the wind. For torpedo-shaped bodies, the stable position is intermediate between the broadside-on position and the desired bows-on position, and for any such body there is a stable "drift-angle" at which the body tends to hold its major axis to the wind. This angle may be between 50 and 90 degrees to the wind.

Fig. 30 shows the resultant forces on a model dirigible for angles of pitch. It is seen that the resultant forces pass forward of the *C.G.* for angles of pitch between 0° and 8°. From 8° up to 30° the resultant forces pass to the rear. In the first instance (up to 8°) the dirigible tends to right itself but beyond this there is a tendency to augment the pitching.

The weight of the dirigible considered concentrated at the *C.G.* will deviate from the vertical and thus causing a righting couple, which will assist in keeping the dirigible more stable.

Consider a dirigible 154 times the size of the model tested, corresponding to a length of 500 feet, has a speed of 60 m.p.h. The wind tunnel air speed is 40 m.p.h., which caused a pitching moment of + 1.48 lbs.-in. at 10° angle of pitch and 0° elevator angle on the model. Therefore, the moment on the full-size machine is

$$\frac{+1.48}{12} \times \left(\frac{60}{40}\right)^2 \times 154^3 = +1{,}013{,}504 \text{ ft. lbs.,}$$

or requiring a positive force on the elevating surfaces situated 200 ft. back of the *C.G.* of

$$\frac{+1{,}013{,}504}{200} = 5{,}067 \text{ lbs.}$$

Similar moments are caused when the dirigible yaws, the righting couple being accomplished by the rudder.

The weight also assists in restoring balance, this time by the "metacentric height" principle when the body rolls.

The main reasons for making tests on models

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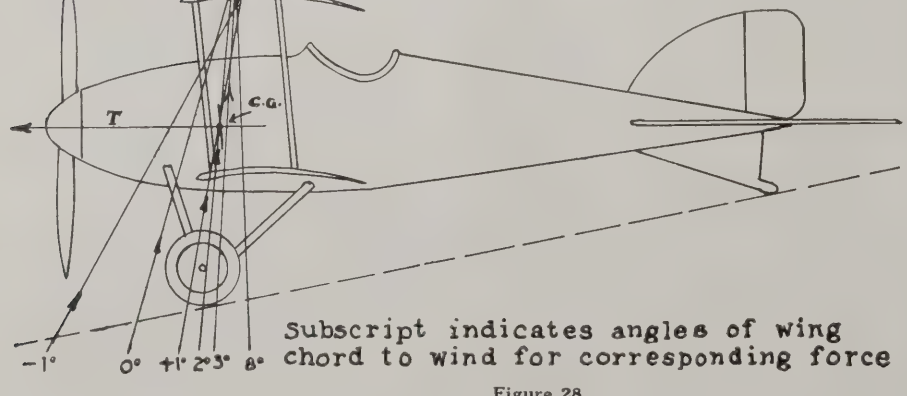


Figure 28

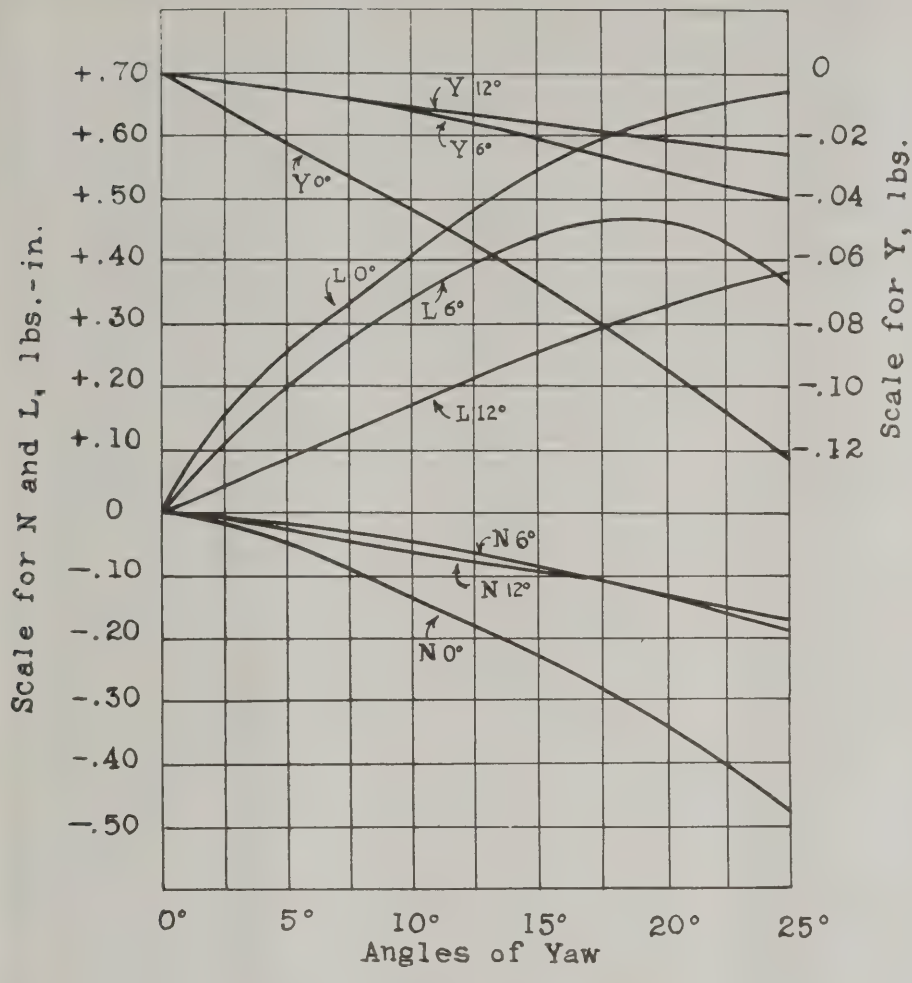


Figure 29

of aeroplanes, seaplanes, and dirigibles are to determine what size controlling surfaces are desirable to overcome the upsetting couples and to find the resistance and lift coefficients of the structures.

Military Requirements

In designing a military aeroplane, such as a bombing-plane, the problems of stability are great indeed. When an aeroplane carries such movable loads as 1000 lbs. of bombs, machine-gun ammunitions, and fuel for 5 hours flight and to take care of this load when first starting out for a bombing expedition and to make allowance for the decreased weight on its return requires much consideration. In such cases the longitudinal *C.G.* may be shifted so much as 4 feet, or even 5 feet. The only alternative to handle this is to have a variable horizontal stabilizer, whereby its angle is controlled, or to make the elevators sufficiently large, which in itself must not be too great.

The problem is no less in the military dirigible. Here nearly one-third of its total weight is a movable mass, and about two-third of this movable mass is losing weight all the time. It is therefore necessary to design powerful controlling surfaces and ballonets, and perhaps in some cases movable weights, when the others are not sufficient to overcome the upsetting couples.

It appears that for extremely small machines high speed is best for its stable flight, while for the heavy bombing machines the attending large moment of inertia is favorable to good stability. In the first case the speed is so great that any gust or disturbance has been passed long before these disturbing elements can have any effect on the machine, while in the latter case the weight is so great and so widely distributed that the forces of the disturbing elements are comparatively weak. In considering these disturbing forces as applied in the above cases, it is implied that wind or wind gusts are no higher than 50 miles per hour in the case of the speed aeroplane and no higher than 30 miles per hour for the bombing machines, the wind or wind gusts acting directly against the machines. In all cases, however, slow speed is detrimental to stability.

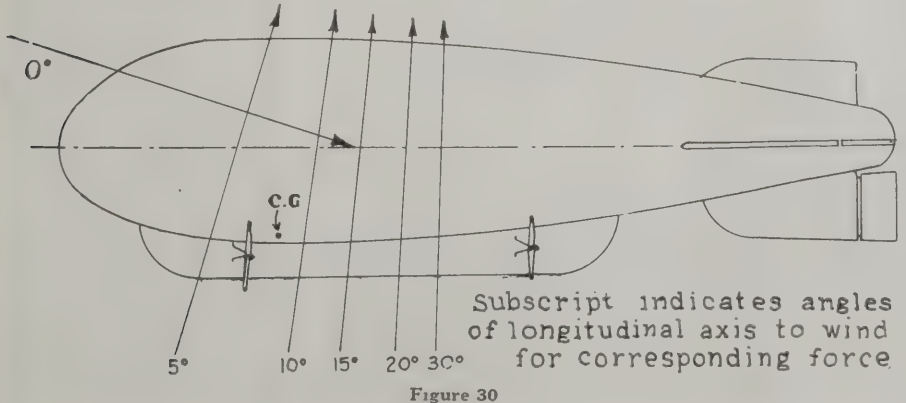


Figure 30

Radiography of Aircraft Metals

W. P. Davey, of the Research Laboratory of the General Electric Company has made some very illuminating tests which seem to confirm that radiography of steel, not exceeding 9/16 of an inch in thickness, is a commercial proposition. The substitution of larger size spark gaps in connection with the X-ray apparatus is expected to increase the thickness of metal inspected by this means. In a number of tested radiographs certain dots and spots were investigated by punching out the metal, with the result that the dots and spots were found to be blowholes. The present line of investigation seeks to determine the smallest air nucleus or other internal fault, which can be radiographed. Considering the complaints over aircraft steels in the past, the X-ray researches commend themselves strongly to aircraft metallurgists and constructors.

High Speed Engines

In this volume much valuable information is presented on the subject of high speed internal combustion engines, especially of the high speed and lighter types. The subject is treated from the theoretical and experimental sides and will make an especially appeal to the more advanced student. It has been the writer's aim to analyze the theories and experiments effecting such types of engines, and to present them in convenient, classified form. The text includes numerous illustrations and tables. The author first treats in detail the subject of thermodynamics of the internal combustion engine, and the explosions and combustion in the engine. The conditions occurring in actual engines and the pressures and temperatures in internal combustion engines are considered in detail. A long chapter is devoted to indicators and indicator diagrams. The mechanics of the high speed international combustion engine and engine balance also receive a detailed treatment. "High Speed Internal Combustion Engines," by Arthur W. Judge. Obtainable at the Aeronautic Library, 280 Madison Ave., New York City. The price is $6.25.

(*Continued from page* 1023)

minute would think of admitting his steam pressure to his cylinders as far ahead of dead cente. as a gas engine has to admit its pressure by star+ ing ignition?

Of course you all know that steam is admitted to a steam engine slightly after it passes the dead center position. So will gas engines admit the spark which ignites the mixture slightly after the crank passes dead center position, just as soon as they are provided with ignition sparks that are hot enough to give the proper rate and speed to the propagation of flame through the mixture.

One might say to this, "why of course, we have to advance the spark in order to get the greatest power out of our engine; if we operate the engine with too late a spark our engine will run hot and will not develop its full capacity of power."

That, of course, with the present ignition sparks is absolutely true, for when lighting a mixture with a weak spark its flame propagation is so slow that unless ignited a long way ahead of dead center, it will still be burning when the exhaust valve opens, and a great deal of fuel will be thrown out of the exhaust valve unburned.

I cannot see how anyone for a moment could doubt the greater value of a hot spark over a weak one. Suppose you were going to kindle a fire in the stove or grate, and wanted to have that fire burning briskly within the shortest possible space of time, would it not greatly facilitate matters if you used plenty of good kindling and lit that kindling with a hot blow torch flame all over at once? Of course it would.

Well, in the cylinder of your gas engine you are kindling a fire and in a high speed motor you have to kindle that fire and burn up all the fuel in an inconceivably short space of time.

This might be an appropriate time to let you know that we are constantly doing a great amount of research work in our laboratory, and we believe that this ideal spark is not only a possibility but a probability. At any rate, we have absolute faith in the accomplishment of it, as the results obtained from our experimental data and research work lead us to believe that we are working in the right direction.

In conclusion, since we have seen that the modern high tension magneto not only gives now, but promises for the future so much better results than any type of battery ignition, is it not the part of wisdom for builders of engines to cleave to and encourage the development of that system of ignition which promises ultimately to properly solve their ignition problems?

CONTACT PATROL

CONTACT Patrol, one of the chief *raisons d'etre* ot the aeroplane, is a special tactical reconnaissance carried out during the progress of an attack. It establishes a liaison between the front line infantry and their battallion headquarters, corps, or division headquarters in the rear. The aeroplane is the most valuable means of connection, and accomplishes the following objects:

1. Keeps higher command informed of own troops movements.

2. Keeps higher command informed of enemy troop movements.

3. Carries messages from battalion headquarters to corps and division headquarters.

4. Reports the state of enemy trenches during an attack, and also reports any new enemy trenches.

There are four methods of signalling from the ground to an aeroplane engaged in contact patrol. They are:

1. Ground strips. This method consists in white strips of cloth which are placed on the ground in various shapes according to prearranged code. Thus, a ground strip in the shape of a "T" might mean "Need Ammunition," or some similar message.

2. Signal Lamps. These are colored lamps with a special slide which permits light to appear in flashes, long and short, and the messages are sent according to the Morse Code, or some other prearranged code.

3. The Shutter. The shutter is a device very similar to the ordinary window blind, with one side of each shutter painted white and the other side black. It is operated by a cord, and the code used is generally the Morse International.

4. Flares. These, as the name suggests, are simply oil-soaked cloths which are lighted by the front line troops to show their position during the attack.

On sunny days the method most used is the panel, but on dull days the lamp is used. Generally an infantry battalion has either the lamp or the panel, (Shutter), sometimes both. The battalion headquarters always has both. All messages are sent from battalion headquarters.

The following are the methods used by the aeroplane to communicate with headquarters. 1. Wireless. 2. Signalling Lamp. 3. Klaxon Horn. 4. Skeleton maps, and messages dropped in weighted message bags. In some brigades, by Very's lights and smoke bombs. In the Very's light method a red and green flare are used, and the succession in which they are fired indicates the message. Wireless is very rarely used in contact patrol work, and is never used to refer to the position of our own troops, as the code might be intercepted by the enemy very easily.

As our own barrage fire is regulated by the aeroplanes on contact patrol the pilot of the aeroplane must be absolutely certain that the troops signaling they are the first line *are* the first line, as a mistake would place them directly under their own barrage from the rear. Thus in very doubtful cases the aeroplane flies so low that the pilot recognizes the uniforms of our own troops. This, of course, makes the work very dangerous. The procedure of contact patrol work during an attack is as follows:

The hour for the attack is know as the "Zero Hour," and all watches and time pieces are carefuly set to coincide to the second. Exactly at the Zero Hour the aeroplane must arrive over the front line trenches, in such a position to be over, or under the expected barrage, generally just over it, at a height of 1,500 to 2,500 feet. The pilot watches the attack until the infantry reaches its first objective, then signals "Where are you?" by one of the methods described above. The infantry, in response lights a flare to show their position, and the pilot traces it in on a skeleton map, and flies directly back to headquarters. Arriving at this position he places the map in a weighted message bag, together with any other message he wishes to send and coming down to an altitude of about 200 feet, drops the bag. If the ground does not acknowledge the message in two minutes he drop another, and keeps this up until his message is received and acknowledged.

An example of the great courage often displayed in this branch of work was shown during an attack on Dead Man's Hill by the French Infantry. As is well known, this hill has passed back and forth many times, and some of the fiercest fighting of the war has taken place on its slopes. During this particular attack, the pilot of the aeroplane engaged on Contact Patrol wished to make no mistake, so descending under his own barrage, to a height of about 100 feet, he flew directly over the heads of his own troop, and literally *climbed the hill with them!*

Contact patrol is thought to be the most dangerous of all the various usages of the aeroplane at the front, and requires a man not only of unquestioned courage. but of great judgment. It is the connecting link between the man in the trench and the man directing the attack, and as such must at all times give accurate information, as one mistake may mean the loss of thousands of lives. It is a work without the glory of the aerial fighter in his scout machine, miles above the earth, but is vitally important to the success of an attack. In an attack, in addition to doing his work, the pilot has five forces to contend with. They are: His own barrage, the enemy's barrage, anti-aircraft guns, enemy machine guns, and enemy aeroplanes. Thus it can be seen that a pilot who flies up and down the lines in a straight line invites destruction. So the pilot must know the trajectory of the heavy guns being used in the barrage, so as to keep above or below it, he must never fly in straight lines, or continue always at the same speed.



The French Brequet, a type of machine used extremely in contact patrol work. (French Official Patrol)

MECHANICAL AND TECHNICAL TRAINING FOR CONSCRIPTED MEN

THE Federal Board of Vocational Education which is cooperating with the Aviation Section of the Signal Corps, has issued the following bulletin concerning training for mechanical and technical occupations in the aviation service:

The general policy of the Federal board in issuing bulletins on the training of conscripted men for Army occupations is to get out a seperate text for each branch of the service. The present bulletin deals exclusively with the Aviation Service. Part I discusses the general questions involved in the establishment and operation of classes for conscripted men for all branches of the Army. Part II deals with specific occupations connected with the Aviation Service.

It must be remembered that by the distribution of men gathered at the cantonments through successive draft calls, the Aviation Service, like other branches of the Army, will be able to secure many mechanics and technicians able either to discharge the work of different occupations or to be readily trained therefor.

According to statements made by Army officials, there will be a shortage of trained men for certain occupations. The list of these, together with the estimated number of men required from all sources prior to June 1, 1918, is as follows:

Mechanics and technicians needed by the Aviation Service.

Cabinetmakers and carpenters	14,400
Chauffers	14,400
Coppersmiths and metal workers	14,400
Motor repairmen	21,600
Instrument repairmen	7,200
Ignition and magneto repairmen	3,600
Welders	3,600
Total	79,200

This bulletin will take up the occupations given above, for which the Aviation Service authorities state there is need for the training which they have requested the Federal board to provide.

Courses of Study

It has been very difficult, for reasons which need not be given here, to secure that definite, detailed information regarding the content of courses of study and standards for proficiency which the schools undertaking this work should have. The information here given represents the best which the office of the Federal board has been able to secure. It will be supplemented at the earliest possible moment with more definite information.

This supplementary information will cover standards of admission to courses, standards of proficiency to be required from pupils as the result of training, and the arrangement of the material in short unit courses, which experience shows to be the most successful method of dealing with the training of conscripted men in evening classes. In the meantime it is felt that the information given below is sufficient to enable schools to go forward with confidence in the promotion of the courses in training suggested.

Eligibility for Admission to Courses

Speaking generally, most of the courses outlined below require at the outset a certain amount of previous experience or training either in those occupations or processes covered by the course or in an occupation containing processes akin to them. For example, the course for cabinetmakers and carpenters, which in reality is a course for wood specialists in aeroplane work, could not be taken successfully by persons without experience in carpentry and joinery, cabinetmaking, or pattern making.

On the other hand, for some occupations, such as motor car and truck driving, training can be given successfully to those having only such elementary knowledge of a motor car as is gained from ordinary driving. In this case admission to the course would involve nothing more than evidence that the applicant had had at least experience in driving a pleasure car.

Requirements for admission must at this time be stated broadly and roughly. With growing experience the schools will soon be able to determine more accurately the experience prerequisite to any given course.

Outline of Courses

Cabinetmakers and Carpenters—Wood Specialists on Aeroplane Work

Men in this work are called upon for repair and replacement work of the wooden parts of aeroplanes. The major part of the work consists in shaping wood, splicing frames and jointing the parts together, and reglueing propeller blades.

Prerequisites.—The source of supply for this course must be found in men who have served in trades involving the working of wood by hand, as pattern makers, carpenters and joiners, and cabinetmakers for one or more years.

Course:

- Woods used in planes—
  - Kinds.
  - Characteristics and strength of each.
  - Special use of each. Why?
  - Method of working each.
  - Recognition.
  - (Samples should be available for inspection and working.)
  - Section shapes used.
- Joints—
  - Kinds used in aeroplane work.
  - Shaping wood for joints.
  - Limiting size.
  - Factor of safety.
  - Each student should become proficient in making close-fitting joints, using pine wood without glue or fastenings.
- Splicing—
  - Methods used.
  - Experience in splicing white pine, without glue or fastenings, making close fits.
- Glue.
  - Kinds, value of each.
  - Use of glue joints.
  - Principle of gluing
  - Preperation of glue
  - Preparation of joint.
  - Experience in gluing joints previously made.
  - Fastening (without and with glue)—
    - Lashing, cord, tape.
    - Bolting.
    - Pinning or doweling.
    - Experience in preparing each one.
  - Repairing and regluing—
    - Preparation of broken parts for splicing.
    - Preparation of unglued surface for regluing.
- Models—
  - Made from dimensioned sketches.
  - Made from blue prints.
  - Made from assemblage of broken parts.
- Field sketching—
  - Sketching and dimension parts of broken pieces—free-hand for replacement.
- Proficiency—
  - Student should be competent to splice, glue, sketch, and work from drawings accurately and rapidly before receiving certificate of proficiency.
  - Students receiving this certificate are not expected to get much additional training at the cantonment; hence must be proficient.

Coppersmiths and Sheet-Metal Workers

This line of service involves the shaping and fitting of small metal parts to planes, connecting up gasoline and metal fittings, and general adjustment and repair of the steering and control cables.

Prerequisites.—Men with previous experience in working sheet metal or copper, tinsmiths, or plumbers and tinsmiths' helpers, also roofers and corrugated-iron workers, would be available for this course.

Course:

- Tools and appliances used.
- Fluxes—
  - Principles.
  - Kinds.
  - Uses.
- Soldering—
  - Principles of process.
  - Kinds of solder.
  - Fluxes for different types of work.
  - Tinning the copper.
  - Care of copper.
  - Preparing the surfaces and tinning them.
  - Sweating jobs.
  - Tinning wires and ends of cables.
  - Radiator repairs.
  - Gas tank and piping repair.
    - Precautions against explosion.
  - Swage unions.
  - Bending piping and fittings.
- Sheet-metal work—
  - Bending and cutting sheet metal.
  - Shaping and fitting sheet metal parts.
  - Making sheet metal parts from sketches and blue prints.
  - Making replacement parts from perfect and broken fittings.
  - Making dimensioned field sketches for bench jobs in replacement.
- Brazing—
  - Principle.
  - Fluxes.
  - Brazing versus soldering.
  - Preparing work for brazing.
  - Cleaning surfaces.
  - Use of flux.
  - Use of different brazing alloys.
  - Brazing.
  - Finished jobs.
- Machine work—
  - Drill press work.
  - Holes in angles.
  - Countersinking.
  - Reboring.
- Hand punch work—
  - When used.
  - Single sheets
  - Multiple sheets.
- Hand shear work—
  - When used.
  - Single sheets.
  - Multiple sheets.
  - Fitting with hand shear.
- Filing, riveting, wiring, and turning edges.
- Working small cold-rolled steel, bar, plate rod.
- Control-cable working (all $\frac{3}{16}$-inch or $\frac{5}{16}$-inch galvanized flexible cable, also nonflexible cable)—
  - Fastening.
  - Splicing in eyes
  - Splicing in thimbles.
  - Soldering joints, etc.
  - Splicing by eyes.
  - Making cables to length—
    - Eye in one end.
    - Eye in both ends.

Hard, or piano, wire is always painted or enameled white, to show presence of rust spots. Cable often crystalizes and breaks occur in the strands. This is indicated by wiping with an oily rag; the rag catches on broken ends and indicates crystallization, with concurrent weakness.

Engine Repair Men

The men in this occupation are for service in the maintenance and repair of aeroplane and automobile engines.

Prerequisite.—The men for this class should be recruited from automobile service stations, garages, machine shops, and similar lines. Extreme care should be used in selecting the personnel of the class because the work requires an unusually high degree of skill and no man incapable of attaining the required proficiency should be retained in the class.

Course:

- General principles of four-stroke-cycle engines, single and multicylinder.
- Engines
  - Types—
    - T head.
    - L head.
    - Valve in head.
  - Multicylinder—
    - Four.
    - Six.
    - Eight.
    - Twelve.
  - Construction and parts—
    - Cylinders.
    - Valves.
    - Pistons.
    - Crank shaft.
  - Ignition system—
    - Magneto.
    - Battery.
    - Dual.
  - Carburetion system.
  - Cooling system.
  - Starting and lighting system.
  - Taking down motor—
  - General plan—
    - System of keeping track of parts for reassembly.
  - Gear relation and identification—
    - Valve gearing.
    - Ignition gearing.
    - Dissembling starting and lighting system.
    - Dissembling ignition system.
    - Dissembling cooling system.
    - Dissembling valve mechanism.
    - Removal of carbon.
    - Regrinding valves, general.
  - Bearing, general.
  - Bearings—
    - Kinds.
    - Use of shims.
    - Pouring babbitt.
    - Scraping and fitting.
- Engine repair:
  - Engine—
  - Valves—
    - Reseating.
    - Grinding.
    - Clearance of stems.
    - Replacement of springs.
    - Timing.
  - Ignition—
    - Wiring diagram.
    - Cleaning plugs.
    - Cleaning, oiling, and replacement of worn parts in magneto.
    - Cleaning and adjustment of points of distributor or coil.
    - Cleaning and testing storage battery—
      - Electrolyte.

- Buckled plates.
- Leaking cell.

Starting and lighting system—
- Wiring diagram.
- Generator.
  - Wiring.
  - Commutator.
  - Brushes.
  - Bearings.

Starting Motor—
- Wiring.
- Commutator.
- Brushes.
- Gears.
- Gear-shifting mechanism.

Fuse block.
Ammeter.
Lights—
- Series and parallel connections.

Carburetor—
- Parts.
- Cleaning.
- Replacing.
- Adjusting—
  - Shop.
  - Road.

Gravity, pressure, and vacuum feed.
Cooling system—
- Radiator.
- Cleaning.
- Repair.
- Pump—
  - Packing glands.

Oiling system—
- Types—
  - Splash.
  - Force feed.
  - Splash and force feed.

Oiling pumps—
- Packing glands.
- Air Pocketing.

Cleaning and renewing oil.
Reassembly of motor—
- General.
- Fitting gaskets.
- Wiring up.
- Timing valves.
  - Clearance.
- Timing electrically.
  - Normal position for spark.
- Reconnecting cooling system.
- Reconnecting gasoline system.
  - Draining and cleaning.
- Reconnecting spark and throttle mechanism.

Testing—
- Shop, adjusting.
- Road, adjusting.

Ignition Repair Men

The duties of this line of service involve the care, repair, and operation of ignition circuits and their appliances, where either the high-tension magneto or the battery is used as a source of power. Instruction is also to be given in the Ford system of ignition, as that type is in common use in all branches of the service.

Prerequisite.—Men for this course should have been employed in electrical work on cars in service stations, or in factories engaged in manufacturing ignition equipment, or in electrical trades dealing with electrical machinery.

Course:

Electricity—
- General principles of current flow in wires.
- High and low tension currents.

Ignition—
- General principles in gas-engine practise.
- Low tension, general.
- High tension, general.
- Dual.
- Magnetos—
  - High tension.
  - Construction.
    - Windings.
    - Use of each part.
  - Effect of grounding.
  - Method of grounding.
  - Safety spark gap, use.
  - Distributor plate—
    - Construction.
    - Use.
  - Chain, or gear, drive.
  - Testing for grounds in coil.
  - Testing for weak magnetos.
  - Remagnetizing magnets.
  - Replacing bearings, sprockets, and gears.
  - Oiling.
  - Wiring diagram—
    - Internal.
    - External.

Battery system, as Delco—
- Primary batteries—
  - Construction.
  - Operation.
  - Uses.
- Storage batteries—
  - Construction.
  - Operation.
  - Charging.
  - Discharging.
  - Sulfation.
  - Buckling.
  - Testing.
- Coil—
  - Core.
  - Insulation of core.
  - Primary winding, insulation.
  - Secondary winding, insulation.
  - Insulation between primary and secondary coils.
  - External insulation.
  - Connection (internal wiring diagram).
  - Delco primary ignition circuit.
  - Advantages of battery ignition.
- Distributor—
  - Breaker mechanism.
  - Cam 8 and 12 cylinder engines.
  - Cam speed versus engine speed.
  - Driving shaft and bearings.
  - Breaker arms, contact points, springs.
  - Use of breaker arms.
  - Safety feature by means of third breaker arm and resistance coil.
  - Condenser, construction, care, use.
  - Adjustment of breaker arms, contact points, and springs (lubrication).
  - Timing with relation to piston, cam shaft, and valves.
  - Synchronizing breaker mechanism for right and left distributors.
- Distribution of high tension current—
  - High tension winding in coils.
  - Contact with rotor.
  - Distributing head.
  - Rotor brush.
  - Wires to plugs.
  - Firing order 4, 6, 8, 12 cylinder engines.
  - Plugs, care and adjustment.
- Ford ignition—
  - General.
  - Wiring diagram.
  - Magneto—
    - Construction.
    - Wiring.
    - Weaknesses.
    - Repair.
  - Coil—
    - Construction.
    - Replacement.
  - Connections.
  - Vibrators—
    - Adjustment.
    - Cleaning.
    - Replacement.

Instrument Repair Men

Men in this line of service are called upon to replace, adjust, repair, clean, and reconstruct the scientific measuring devices upon the aeroplane, such as barometers, ammeters, compasses, and clocks.

Prerequisites.—Men who have been watch repairers, jewelers, gauge makers, or assemblers, electrical instrument repair men, or scientific instrument makers, or repairers, should have the qualifications for admission to this course.

Course:

Aneroid barometer—
- General.
- Pressure chamber.
- Indicating mechanism.
- Spring tension.
- Scale.
- Adjustment by standard barometer.
- Replacement.
- Case.
- Scale.
- Pointer.
- Pawl and rachet.
- Spring.
- Pressure chamber.

Tachometer—
- Construction.
- Calibration if necessary.
- Lubrication.
- Method of connecting in place.
- Flexible shaft.
- Gears.
- Dials and pointer.
- Replacement.
- Flexible shaft.
- Gears on motor.
- Gears in instrument.
- Dial or pointer.
- Indicating mechanism.

Oil pressure gauges—
- General—
  - Coil.
  - Lever mechanism.
  - Springs.
- Replacement—
  - Coil.
  - Dial.
  - Indicating mechanism.

Volt and ammeters—
- General construction—
  - Magnets.
  - Coil.
  - Spring.
  - Supporting pivots.
  - Indicating mechanism.
  - Dial and case.
- Testing for burned-out coils.
- Locating grounds.
- Calibrating, or correcting, instrument.
- Replacing—
  - Magnets.
  - Coil.
  - Spring.
  - Indicating mechanism.

Compasses—
- General construction—
  - Air.
  - Spirit.
    - Expansion chamber.
    - Relative accuracy for aeroplane work.
    - Effect of slow response of needle.
    - Variation and deviation.
      - Correcting for—
    - Replacing cover glass.
    - Replacing spirit.

Clock repair.—The student should become familiar with the general construction of clocks, their major troubles, lubrication, and general repair.

Motor Car and Truck Chauffers

The men in this branch of work are called upon to drive motor vehicles of various types and are expected to be able to make ordinary road repairs, as well as keep their machines tuned up at all time.

Prerequisites.— The best training for this service is to have driven a motor car of some type. However, a man mechanically inclined, with an alert mind, can be developed by proper instruction to be a very capable operator.

For properly carrying on this work the school should have available for instructional work standard chassis having engines of four and six cylinders, and it is desirable to have those containing eight and twelve cylinders, if possible.

There should be the various parts of a car in a partially or wholly dissembled state, as engine, crank shaft, cylinders, pistons, connecting rods, cam shaft, 2 to 1 gears, carburetors, pumps (oil and water), ignition systems (coil and magneto), clutches, universal joints, transmission, differential, axles (rear and front), steering gear, lighting and starting systems, tires, tubes, etc.

One or more cars or trucks should be available for driving. In case there is difficulty about this, it may be possible to arrange with some business concern for the use of a truck and driver for evening work.

Prerequisites.—This course should be open only to men familiar, in general, with the operation of motor vehicles, or with considerable experience with machines and mechanical work.

Course.—The course should cover the following subjects, and there should be as much actual laboratory instruction coordinated with the lectures as it is practicable to give:

1. Front axles and steering gears, including the adjustment and lubrication of front wheels, tie-rods, steering arms, tires and rims, The lining up of front wheels and care of various types of steering gears should also be given special consideration.

2. Rear axles, considering adjustments of wheels, radius rods, chains, differentials, brakes, and thrust rods. The repair and relining of brakes should also be taught.

3. Transmissions and clutches, taking up dissembling, replacement, and adjusting of transmission gears, bearings, universal joints, stuffing boxes, care of cone and disk clutches, relining clutches, adjustment and care of clutch mechanism.

4. Engines, including valve grinding, valve adjusting, bearing adjusting, care of lubricating systems. Locating trouble, such as missing cylinders, knocks, etc. Fan adjustments, care of cooling system, and operation and testing of engines in general.

5. Lubrication, including engine, clutch, universal joints, transmission, rear and front wheels, steering gears, and all other parts requiring lubricating.

6. Ignition, care and field repair of law and high tension magnetos, battery systems, wiring cleaning plugs, distributors, vibrators, etc., and locating and correcting troubles due to defective ignition, such as may occur on the road.

7. Carburetion, including fuel lines, gravity, pressure and vacuum systems, care of fuel tanks, adjustments to various standard types of carburetors. Effect of different mixtures on behavior of engine.

8. Driving, including manipulation of the clutch, gear shifting, use of brakes and of engines as a brake. Backing, starting, and stopping properly. Driving in sand, mud, wet clay. Use of chains, maneuvering of car in close quarters.

It should be borne in mind that the aim is to develop a capable, efficient driver who can take proper care of his car or truck. Those who have not attributes giving hope of attaining the proper proficiency should be dropped from the class at once.

No certificate should be awarded except for complete proficiency in all the prescribed lines.

Welding—Autogenous

Men in this class of service are called upon to weld various metal parts of aeroplanes and their mechanisms, to braze joints, and to do various work in this line upon any of the appliances used by the Aviation Service.

Prerequisites.—The classes should be limited to men with previous experience as welders; to men with previous experience in the metal trades interested in this subject; or to promising novices genuinely interested in the work who may be expected to develop into capable workers.

Course:

General principles of the work from chemical and metallurgical standpoints.

Acetylene—
- Generation—

(*Continued on page* 1038)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Dictionary of Military Aeronautics

Aerodrome.—A large space of land divided into three parts: (1) A muddy portion where the mechanics take exercise. (2) A danger spot surrounded by red flags. (Flying pupils usually land here.) (3) A safety stretch where accidents occur.

Aeroplane.—A machine designed for carrying mud from the aerodrome to the sheds. There are three kinds of aeroplanes: (1) Those that fly. (2) Those that don't. (3) Those that stand on their noses.

Pupil (Elementary).—A man who meanders about the aerodrome in an antiquated "bus." He wears a tense expression and hopes his engine will burst before he "gets off."

Pupil (Advanced).—A man who stops his propeller in the muddy portion of the aerodrome, and beckons for assistance. When the mechanics arrive he smiles sweetly, says "Sorry," blames the throttle lever, and does it again next time.

Mechanic (2nd Class).—A hapless individual who wears baggy overalls, and is certain that he'll get his "First" next month.

Mechanic (1st Class).—A confident youth who knows the Christian names of all the sergeants.

Motor Transport Driver.—A man with a past, who talks in a superior manner of Talbots and speed records, and then drives a Ford box into the nearest ditch.

Acting Corporal.—A person.

Corporal.—A sort of Jack-in-the-box who seems to know by instinct the whereabouts of the Flight-Commander.

Sergeant.—A man with an enormous appetite who is promoted to Flight-Sergeant if the 2nd A.M.'s work hard enough.

Flight Sergeant.—A species of sergeant with a louder voice and seven shillings a week extra.

Quartermaster-Sergeant.—A N.C.O. of great versatility. He can guess the weight of ¾ lb. of meat to within 11 oz., and he is capable of giving hints to the producers of "The Clutching Hand."

Sergeant-Major.—A man who can see at a glance whether a mechanic shaved in the morning, or the night before. His regimental name is "Sir!!"—and don't forget it!

Equipment Officer.—Petrol expert, car expert, aviation expert, and spends his spare time paying for deficiencies, and going bald.

Adjutant.—Sh!

Instructor of Flying.—!

Captain of Flight.—!!

Major.—!!! (I dare not say more, fear less I get catched.)

Technical Stores.—This is a building, or part of a building, where worried-looking individuals collect blue forms and issue nuts and bolts of the wrong sizes. Now and again a mechanic obtains what he really wants. On these occasions all the storemen are promoted and the Equipment Officer gets—No he doesn't, he's a teetotaller.

Leave.—Leave is granted so that the revenue of the Post Office shall be increased. A man applies for leave because his grandmother is expecting another funeral, or his brother is going to the Front. The local police receive a telegram asking them to make inquiries. The reply telegram, of course, is in the affirmative. The man is permitted to go, but before he arrives at his home a telegraphic message is sent recalling him. He telegraphs to his best girl, telling her the theatre party is off, and then telegraph to his C.O. explaining that he has missed the last train, and can he return in the morning. The C.O. wires back he must return at once, so he catches the next train and returns at once.

First Flight (of a mechanic).—This is a very important affair, and consists of several stages:

(1) *The Period of Preparation*, during which the mechanic robes himself in a borrowed helmet and goggles, and tries hard to behave as if he were quite used to such ordinary events.

(2) *Banking.*—The machine dashes away, climbing rapidly against the wind. The passenger begins to gain confidence and ventures to look over the side. The land has taken on a new aspect and appears to be a Gamages' toy farm. He becomes fascinated and is just deciding that he'll make a good aviator, when his equilibrium receives another shock. The left wing drops time getting round. Heavens! he can't get straight and we're falling sideways." Round and round they go while the machine appears to do a giddy falling spin on the lower wing tips—"I promised Maud I'd never fly, and now——" His breath does a topsy-turvy stunt as he sees the earth performing all sorts of acrobatic tricks. Almost two seconds have elapsed since the spiralling commenced, but ten minutes seems quite a small estimate. "If we ever get out of this I'll never have another joy ride—Never!" He tries hard to look at the pilot, but the rushing wind squeezes him down into his seat and a few more agonizing ten minutes go by.

At last—what relief—the aeroplane flies straight again and the engine picks up her "revs." once more. "I knew we were safe—he's a fine pilot." He looks down again and finds the earth quite near and the aerodrome sheds about two miles distant.

The engine is suddenly throttled down and the machine's nose rips as they glide towards the landing ground. He feels the wheels touch the ground, and he decides he'll never swear again nor smoke any more cigarettes. They bump over the ground and swing round in front of the sheds—"Thank you very much, Sir."

"How did you like the spiral?"

"Er—the spiral?—Oh! the best sensation I've ever had!"

"That's good—Rather a nice spiral!"

He gets out of the "bus" and strolls with a fine show of sang froid to the other mechanics.

"What was it like?"

"Great—I enjoyed it no end."

"You look a bit pale."

"Ah! that's the wind—rather cold, you know."

"Are your feet cold?"

"Yes, a bit."

"Thought so!"

"I suppose we were about an hour?" (Said with great unconcern.)

"Seven minutes, old man."

"Seven—? Well, it seemed much longer."

"Yes, the time does drag when you thoroughly enjoy yourself."

He goes to the sheds with a feeling that he is discovered. You see "cold feet" in civilian language means "fright"!

R. C. V.



"It's a good thing we've got mosquito netting on our windows"

The Westmoore



ARMY

The West Woodworking Company

Eastern Selling and Export Branch

One Wall Street, New York City

Westmoore Propellers stand for the maximum of efficiency and dependability. They are made from the finest quality of selected stock which is scientifically kiln dried and carefully handled in every operation from the rough lumber to the finished product by a firm which has been acknowledged specialists in working lumber for the highest class of woodwork for over thirty-five years.

A distinctive feature of Westmoore Propellers is the "Swesco" Process Glue used in their manufacture. This glue, which was developed by the company, is practically waterproof and of great tensile strength. U. S. Government tests show a shearing strength (normal test) over 2,000 pounds per square inch; after soaking fifteen hours in water, over 800 pounds per square inch.

Propeller problems submitted to us are scientifically worked out by able designers. The U. S. Government analyzed and adopted our design for one of the prominent training type motors without change except for position of the bolt holes for the hub flange. We also build propellers to customers' designs.

The Westmoore



NAVY

We manufacture two special types:

Westmoore "Splitless" Propellers

The reinforced or "Splitless" type is recommended for flying boats, combat machines and all high powered motors.

Westmoore "Regular" Propellers

are used in all types of aeroplanes and training machines. They stand up when others fail because of the excellence of the glue, finish and workmanship.

Prompt Delivery Assured

The factory is modern and efficiently equipped for aircraft work, embracing every essential necessary to quick and satisfying service. The machinery is strictly up to date and includes the latest types of automatic propeller construction appliances. It is uniformly heated and protected by automatic sprinkler system. It contains seventy thousand feet of working floor space and the organization comprises the highest class of carefully trained cabinet makers who have been educated and encouraged by long and loyal service to appreciate the exacting requirements of the firm's standards of excellence and efficiency.

Laminated Wood Department

Veneers for pontoon and general construction work. Three ply waterproof for pontoon work. Three ply and five ply for above water construction.

Service

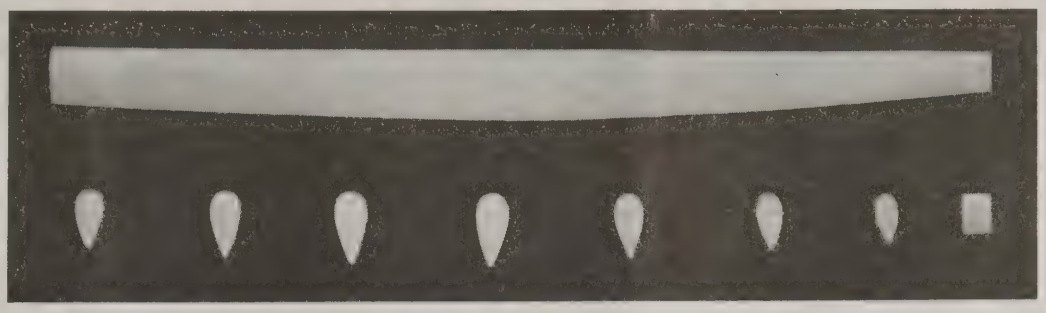
Samples and quotations will be promptly submitted upon request. Quantity production in propellers and laminated wood invited. Special attention given to experimental orders.

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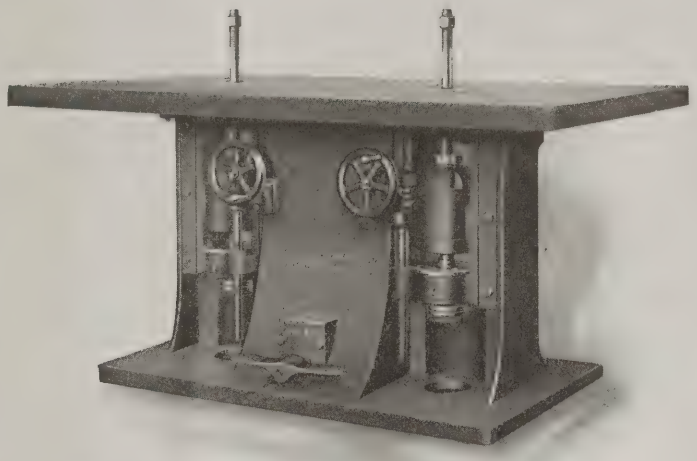
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Was cut on a

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No trick to do it

Do you want to know how?

Write

Baxter D. Whitney & Son
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(*Continued from page* 1030)

the hot iron takes the oxygen out of the water, forming an oxide of iron again and allowing the hydrogen and undecomposed steam to pass on to the scrubber, when the gas is cooled and the steam condensed. The hydrogen continues further to the purifiers and holders, from which it is drawn into the balloons or gas containers.

When once understood the process is very simple and sure in its operation, and no trouble at all has been experienced in handling this plant. The ore has a life of about six to ten weeks, when it crumbles so much that it must be removed and replaced. Some of the old ore may be reused if it is still in lumps. The steel cylinder will last several months (but the top finally burns off, causing a replacement of merely a top section.

For a permanent hydrogen plant the iron contact process has no competitor, and for a portable plant it surpasses all others because of the advantages—low cost, common raw materials, which are in no way dangerous to handle, no objectionable waste products and simplicity of operation.

Another advantage of a portable plant is that it can be placed at each of the aeronautical training schools for teaching free ballooning and kite work, as well as heavier-than-air machines; and in case of emergency, plants can be transferred very quickly to any part of the sea coast or border line. As gas-making material can be procured in any part of the country; in the East coke and anthracite coal; in the South even coke, and in the West, or Pacific Coast, petroleum coke can be produced; gas-making material would not have to be transported any great distances. After their primary use had been discontinued the portable plants could be stored in the navy yards to make gas for welding, as gas made by this process can be made cheap enough to be used for commercial purposes.

British Aviators to Get Increased Pay

The arrangements which have recently been made for augmenting the pay of officers in the Navy and Army are applied to the holders of equivalent ranks in the Flying Services. All ranks from second lieutenant to lieutenant-colonel are to receive increased pay and provision is made for extra allowances in respect of children.

Sir Douglas Haig Calls for More Aircraft

At the conclusion of his despatch dealing with the battles of 1917 in the West, Sir Douglas Haig pays a splendid tribute to the work of the R. F. C., which he says, in the discharge of duties, constantly increasing in number and importance, throughout the whole of the past year, has shown the same magnificent offensive spirit which characterized its work during the Somme battle, combined with unsurpassed technical knowledge and skill.

Referring to future efforts, Haig warns that efforts to secure maximum production must not be relaxed, for:

"The enemy shows no signs of relaxing his endeavors in this department of war. While acknowledging, therefore, most fully the great effort that has been made to meet the ever-increasing demands of this most important service, I feel it my duty to point out once more that the position which has been won by the skill, courage and devotion of our pilots can only be maintained by a liberal supply of the most efficient machines."

Personal Paragraphs

K. B. MacDonald, formerly vice-president of the Curtiss Aeroplane and Motor Corporation, is vice-president of the Curtiss Engineering Corporation, Garden City, N. Y.

S. R. Bennett, formerly assistant supervisor, Bosch Magneto Co., Springfield, Mass., is now supervisor of the testing departments.

Roland Chilton, formerly engineer at 1790 Broadway, New York, is with the Aeromarine Plane and Motor Co., Keyport, N. Y.

N. J. Clausen, formerly draftsman, Otis Elevator Co., New York, is with the Curtiss Engineering Corporation, Garden City, N. Y.

Aeroplane Manufacturers Enlarge Facilities

The Springfield Aircraft Corporation, Springfield, Mass., is building an addition to its plant to cost about $50,000.

The United States Aircraft Corporation of San Francisco, Cal., has bought the plant of the Christopherson Aircraft Co., Redwood City, Cal., and will double the capacity.

The old plant of the Bay City Box & Lumber Co., Bay City, Mich., has been purchased by a newly organized company, in which Bay City, Detroit and Toronto capital is interested, to manufacture aeroplane parts for the Government. Additions are planned so that later complete aeroplanes may be manufactured. Capt. E. L. Janney, Canadian army aviator, announced the formation of the company.

The B. F. Sturtevant Co. of Boston has tentative plans for an addition to its factory at Readville, Mass.

The Benoist Aeroplane Co., Canton, Ohio, is equipping a temporary building and announces that it will build a new plant next spring.

The Hess-Bright Mfg. Co., Philadelphia, will increase its capacity 25 per cent and is reported to be ready to buy a large number of tools.

The Burgess Co., of Marblehead, Mass., has announced the awarding of a contract for a machine shop, 84 by 55 feet, and for a boiler house.

Air Radiers Expected Over Paris

Measures for the protection of the population of Paris from air raids are being taken by the Government, according to the New York Sun. Recent construction in Germany of a great number of bombing aeroplanes capable of high speed and carrying aerial bombs of considerable destructive power suggest the possibility that Paris may soon be the object of aerial attacks.

While the anti-aircraft defense of the capital has been strengthened all the way from the battle front certain precautions in Paris itself are about to be taken. Orders have been issued that all industrial plants and factories in the city and suburbs working at night must have their windows and skylights painted blue.

The stations and tunnels of the network of the subway system will be thrown open to the public when warning of an air raid is received, the electric current being cut off at the same moment. The churches of the city also will be thrown open. Directions for the public to follow in case of a raid will be placarded thoughout the city.

Three American Aviators in France Killed

First Lieutenants William H. Cheney and Oliver P. Sherwood and Private George A. Beach were killed Sunday in a collision of aeroplanes over an American aviation school in France, the War Department was advised by General Pershing.

No details of the accident were given in General Pershing's message.

Thomas

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NEW EPOCH IN AVIATION

POPULAR PRICED
TWIN MOTORED HARLEY-STROMER
AEROPLANES
HYDROAEROPLANES — FLYING BOATS

Standardized *As to* { EFFICIENCY, SAFETY, DURABILITY, PRICE, MANUFACTURE, MATERIALS, ENGINES, CONTROL

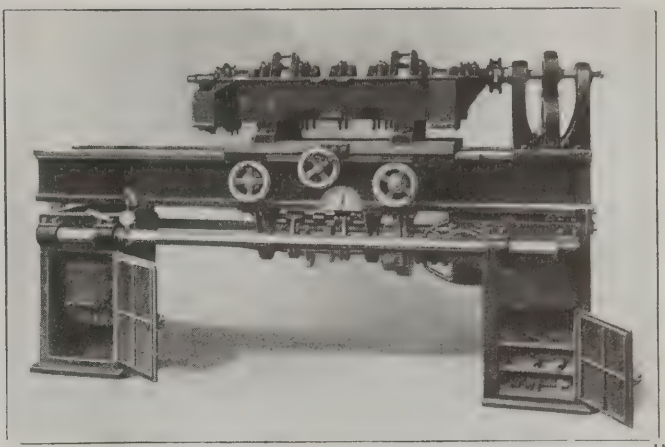
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A Training Machine for Military Purposes.
Training Machine for the Student Aviator.
Pleasant and Safe Machine for the Sportsman.
Machine for Commercial Purposes, Mail and Express Routes.

GUARANTEED PERFORMANCE
38 to 60 Miles Per Hour
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four men in a corner

Four men, with one Carwen Dynamic Balancing Machine, a couple of cheap static-balancing fixtures, and a drill press, will do the work of 100 to 200 men using the forms of apparatus heretofore employed for balancing motor crankshafts.

That is for quantity production—say 100 crankshafts per 8-hour day.

One man, doing the entire job alone, will balance about 20 crankshafts a day, using the Carwen method.

No unusual skill is required. To break in a new operator takes but two or three hours.

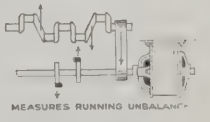
Figure what the saving means on your production.

The Carlson-Wenstrom Co.
Erie Ave. at Richmond St.
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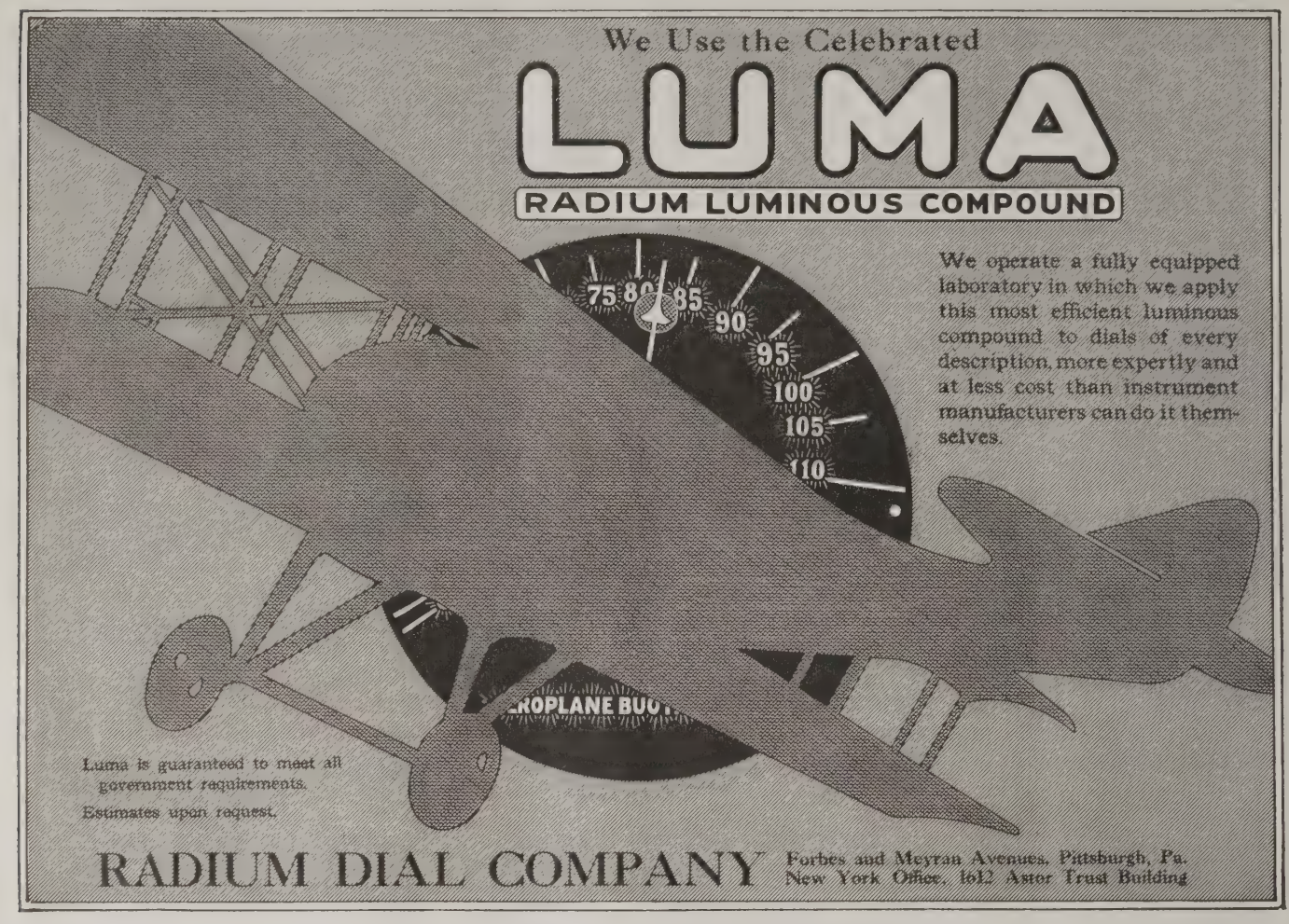
Makers also of Carwen Ball Bearings

We gladly demonstrate.

Have you received your copy of the booklet?



CARWEN
Dynamic Balancing Machine
(AKIMOFF PATENTS)



(*Continued from page* 1028)

Types of generators in common use.
Operation and care of each.
Precautions to be observed.
Methods of generation.
Storage and shipment.

Oxyacetylene equipment—
Acetylene.
Oxygen.
Burner.
Glasses.
Pressure gauges and reducing valves.

Welding—
Care and regulation of the flame.
Precautions against explosion.
Use of fluxes.
Use of brazing material, etc.
Preparation of joints.
Preheating.
Effect of expansion and contraction—precautions.
Building up materials.
Slow cooling.
Precautions against burning surrounding material.
Dressing and finishing the job.
(Each student should have experience in welding various metals, such as iron, steel, aluminum, brass, etc.)

Method of Instructiou

The instruction should be given on the individual rather than the group basis. This means that at the very outset effort should be made to learn by conference and direct test in what portion of the course, if any, the student already shows proficiency. He should be given credit for this and the remainder of his work should be assigned to him in definite order.

To do this, it will be necessary to break up the entire course of training into a series of short unit courses, each dealing with some process or phase. These short courses should be numbered in the consecutive order in which they should be taken. Not only should a student be given credit for every course in which he is able to show proficiency at the start but the instructor should be ready at any time to examine him on the work of any short course in which he is engaged. When he shows proficiency therein he should be given credit for it and promptly assigend to the succeeding short course.

This will require a system of records in the hands of the pupil and displayed on the shop or schoolroom wall, so that at a glance both the instructor and the student may be able at all times to visualize the latter's status in the course. In this way it will be easily possible for the instructor not only to make the best assignment of new short unit courses to men upon the satisfactory completion of old ones but to utilize to the best advantage his equipment for the different short unit courses.

When the student applies for the course, he should be given an opportunity to demonstrate his mastery of any one or more of the requirements in any one of these short unit courses, leaving for the classroom instruction only those in which he is not proficient.

Inasmuch as the subjects of these short unit courses have no direct interrelation, so that none of them may be regarded as prerequisite to any other, a standard equipment necessary to give instruction to three pupils in each of these courses could be so used as to give instruction to twenty-four pupils at one time, the students being distributed among the courses so as to keep all the equipment busy at once.

The course, as outlined, was given last May to a group of men, all of whom had had some experience in a garage or in repair work on their own cars. These men were volunteering as truck drivers for the Quatermaster Corps, and in thirty-six hours of evening-school instruction as above outlined they were, in the opinion of Regular Army officials, better prepared for motor-truck service than any similar group that had been funished to the Army up to that time. It is suggested that should this course be lengthened so as to increase the number beyond thirty-six, the number of hours for each short unit course within the full course should be increased in the same proportions.

Appendixes A and B give descriptions of the organization of the evening class for motor-truck drives as above outlined, together with a set of examination questions which were used in testing and classifying the students at the time of entrance to the course. This information is given purely as a suggestion of the method whereby, as experience has shown, these short unit courses in instruction may be most successfully given.

Equipment

While it would be undoubtedly a great help in securing the training called for in this and other circulars by the Federal board, it does not seem feasible, at the present time, to expect from the National Government any assistance in the way of equipment for doing the work. The Government is doubtless having difficulty in securing all the equipment it needs for the cantonments and the active service. Consequently, schools will have to rely on the equipment which they now possess, together with such additional equipment as school officials may see their way clear to get in order properly to discharge this important task of training conscripted men.

It goes without saying that the instruction given should be practical and direct in character. What is needed is not book instruction, or lectures, or classroom instruction, but actual practise in the work itself, accompanied by explanation, diagram, illustration, supplementary instruction, and reading.

Unless schools are in a position to provide the equipment necessary to enable the conscripted men actually to do the things they have been taught, as far as the course provides, they should not undertake to train for any of the occupations outlined above. It is important, above everything else, that the Government should at this juncture be able to rely upon proper training, where such training is undertaken, rather than on misguided and inefficient efforts, however well intentioned.

It would be far better for the State board of vocation education of any State to secure the establishment of a small number of training classes doing the work well than to have local schools and classes undertake to do that for which they are not equipped, from the standpoint of either facilities or instructors.

Site at Riverside, Cal., Chosen as Flying Field

Establishment of an army flying field at Riverside, Cal., has been authorized by the War Department. It was announced that contracts calling for construction of hangars, barracks, machine shops and storage warehouses already have been prepared, though the firms and the amounts involved are withheld for the present.

The Riverside station is to be what is known as a "one unit field," meaning that four complete aero squadrons with all the men and material necessary to keep them in operation will be maintained there. The typical army aero squadron consists of twelve aeroplanes ready for flight and from two to four times that many in reserve or undergoing repair to replace those damaged and destroyed. A force of thousands of mechanics and other skilled help will be established at Riverside in connection with the new field.

(*Continued from page* 1014)

military aviator duly qualified and serving has the rank, pay, and allowances of one grade higher than that held by them under their commissions, provided that the ranks under their commissions are not higher than that of captain.

"(8) As their pay is barely sufficient, no changes should be made until the needs of military aviators are better defined and more completely met by the Government.

"(9) It seems strange that America, the richest nation in the world, should be the first nation in all history to reduce the pay of any combatant force in the face of the enemy.

"(10) Should this contemplated legislation go through, it will serve to dull, to a considerable extent, the enthusiasm of our fliers, and it will make our task a thousand-fold more difficult, as it will strike at the very heart of the Air Service organization and make almost impossible the development of the superior esprit de corps needed in the Air Service to maintain supremacy in the air.

"We appreciate fully that this is one of hundreds of things that only those who are in close touch with aeronautics can understand, and that while the above mentioned reasons may have escaped the attention of those who proposed the change in the law, they may not escape your attention.

"Knowing the enormous pressure under which every department of the Government is working we would hesitate to add anything further for your consideration. But we feel that you will agree with us that this matter is of extreme importance.

"Assuring you again of the hearty co-operation of the Aero Club of America and constituent Clubs in the building of our Air Forces, I beg to remain "Yours very cordially,

(Signed) "ALAN R. HAWLEY,
"President, Aero Club of America."

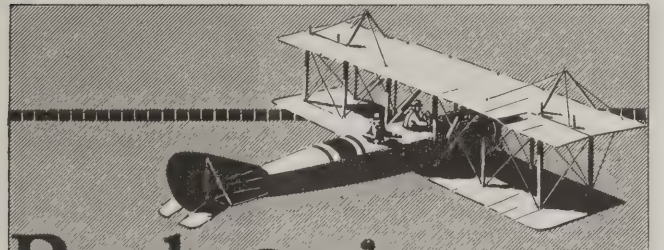
It expressed exactly the feeling of the Army officers, of the aviators, and of the Government authorities and parents of American aviators with whom we have spoken about the matter.

The tragedy of the aviator whose pay is not large enough to permit him to purchase the additional equipment that he needs is closer to all of us than we realize it. It is only reasonable to believe that the British aviator mentioned above, who defeated the Germans single-handed, and prevented a severe defeat to the Allies, could not have gone back after the first flight if he had been numbed by the cold; due to lack of clothing or gloves, and parents of American aviators know only too well how many things are needed but are not supplied by the Government. What chances would an American aviator stand of getting two pairs of gloves issued on the same day—if he burnt or tore one of the gloves in a flight?

The French, Italian and British aviators, who also get increased pay, are near home and can more easily get whatever they need. American aviators are 3,000 miles or more from home, and must purchase the things they need. They can only purchase these things if they have the funds, and these funds in most cases can only come from their pay.

It is understood that the military authorities who are quoted as approving the cutting down of the aviators' pay were only asked for an opinion based on the argument that flying is as safe as every other branch of the service. Now they should be asked to consider the other aspects of the question.

Above all, this great country of ours has made a contract with these American boys. Is it going to disregard it? Is it going to make it a "scrap of paper"? Yours very truly, M. E. F.



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Weekly

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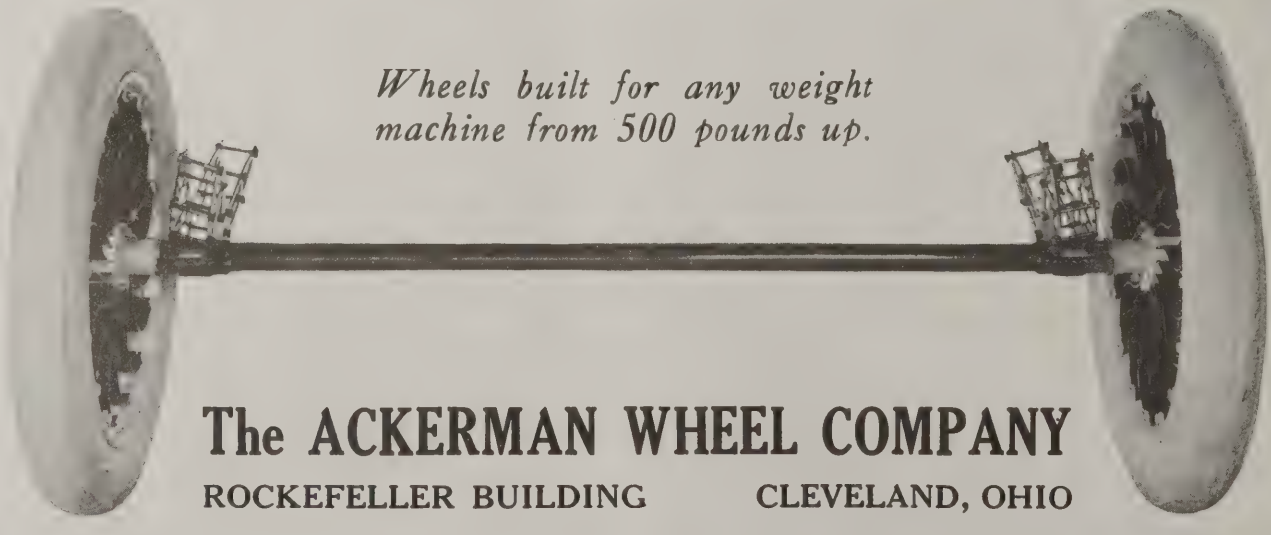
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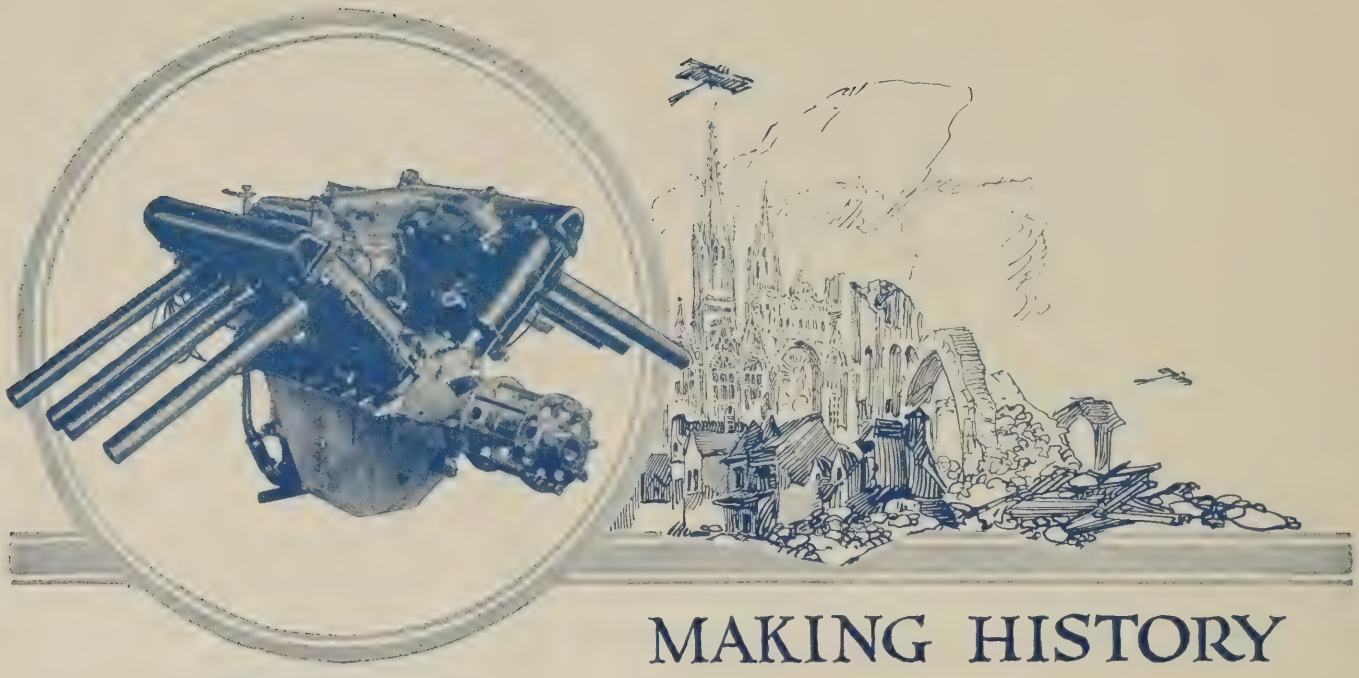
Vol. 6, No. 24 | FEBRUARY 25, 1918 | 10 CENTS A COPY



One of the 140 Official French paintings of Lieut. Henri Farré which are to be exhibited at Anderson Galleries, 59th street and Park avenue, New York City, March 10 to March 20

Aero Club Again Protests Against Cut In Aviators' Pay

NOTICE TO READERS
When you finish reading this issue place a one-cent stamp on this notice, hand same to any postal employee, and it will be placed in the hands of our soldiers or sailors at the front.
NO WRAPPING—NO ADDRESS
A. S. Burleson, Postmaster-General



Hispano-Suiza Engine

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AERO CLUB AGAIN PROTESTS AGAINST PROPOSED LEGISLATION TO REDUCE AVIATORS' PAY

THE Aero Club of America has again protested against the proposed legislation which has for its object the reduction in pay and rank of American aviators. This protest was contained in a letter, signed by Mr. Alan R. Hawley, the President of the Club, and addressed to Secretary Baker, Senator Chamberlain, Chairman of the Senate Committee on Military Affairs; Congressman S. Hubert Dent, Jr., Chairman of the House Committee on Military Affairs; Major General George O. Squier, Chief Signal Officer; and Howard E. Coffin, Chairman, Aircraft Board.

The letter follows:

"Dear Sir:

"The recent increase in deaths at the Army aviation camps has brought to us another flood of inquiries and suggestions from parents whose boys are under training either in the United States or in France or England, and there are several new aspects, not yet presented, or so far as we know, considered, which makes the responsibility of cutting down the pay of aviators at the present time too excessive for anybody too assume.

"In our letter to you of January 29th, which was also sent to Secretary Baker, Senator George E. Chamberlain, Chairman, Senate Committee on Military Affairs; Congressman S. Hubert Dent, Jr., Chairman of the House Committee on Military Affairs; and General Squier, we pointed out the economic problems of the aviators, and the fact that whereas an aviator is supposed to be worth 2,000 soldiers, and most aviators are; and whereas the needs of an aviator are not yet defined, it would be inadvisable to cut down the pay of the aviators in the face of the enemy.

"Since writing this letter, we have had to give thorough consideration to the ways and means of building our air forces so as to whip Germany, and in connection therewith, we have had to figure out as closely as is possible what developments are likely to take place in military aeronautics at the fighting fronts. In other words, what the Allies will be forced to do owing to the increase of the German air service. A great deal has been published of late regarding the German project to increase their air forces. Therefore, we must look ahead to meet them. We must likewise look ahead to do something more than meet the German developments, so as to place the Allies on the offensive instead of merely on the defensive.

"Looking ahead, we see some very important points which have not been heretofore considered, and which will greatly increase the aviation casualties and make the air service the most dangerous branch of the service. Some of these points are as follows:

"(1) Owing to the necessity of hastening the training of aviators, the training being given is much faster and more intensive than it was heretofore. Therefore, the casualties during the period of preliminary and advanced training are much greater.

"(2) Owing to the great increase in the number of students in the various stages of training, the aviation training camps are crowded, and that has resulted, and may be expected to result in more casualties, due to collisions in the air and on the ground.

"(3) Whereas it has been found that the German aviators have developed in a high degree of aerial acrobacy and skill in manoeuvering their aeroplanes in the air in aerial fighting, the training necessary to make a complete military aviator is much greater than it was heretofore, and the amount of aerial acrobacy that he must learn to fit himself to meet the enemy is so extensive and the dangers involved in this phase of the training is so extreme as to make the training period many times more dangerous than the training period of any other branch of the service.

"(4) We can already see indications that this coming season will see a marked increase in fighting in the air. It is to be expected that the Germans will try to maintain their suupremacy in the air at the fronts by sending large air fleets of aviators who will fly in formation, to break which, the Allies will also have to send large air fleets. his will increase the extent of our flying tremendously and the casualties in the air in proportion.

"(5) It is generally accepted by the Allied strategists that it is necessary to strike Germany through the air, sending large bombing squadrons to bomb German military and aeronautic bases and centers of transportation at night. This will mean sending large numbers of aviators on extensive night bombing expeditions far over German soil. Night flying in parties is dangerous; having to fly far over German soil is exceedingly dangerous; and having to fly so low so as to hit the targets and do real damage is extremely dangerous.

"(6) These are so strikingly evident and close that they are beyond question.

"Looking somewhat ahead, we can see other developments—things which we shall have to do to maintain our supremacy in the air—which will great increase the danger in the air service—but which it is best not to put in writing in a letter like this, which is to be made public.

"We therefore urge in all earnestness that no such wrong be committed against the air service as is proposed in the measure intended to cut down the pay of our American aviators.

"Assuring you again of the cooperation of the Aero Club of America and the affiliated Aero Clubs and cooperating organizations in anything that tends to build and develop our air forces, we beg to remain

"Yours very sincerely,

(Signed) ALAN R. HAWLEY,

President, Aero Club of America."

Army Aviators' Pay

(*Editorial in N. Y. Times*)

WHEN General Pershing, with the approval of General Foulois of the Aviation Field Service, recommends that extra allowances to army aviators be stopped, because "flying duty is no more hazardous than duty with other combat troops and involves nothing like the hardships endured by troops which occupy trenches," the soundness of the reasoning is not to be challenged; yet would it be wise to repeal all extra pay allowances and create a new grade of civilian aviator to be paid $150 a month, as Secretary Baker has proposed in a bill submitted to the Senate Committee on Military Affairs?

It would be unfortunate to discourage volunteering for commission in the Aviation Service when the demand for officers must rapidly increase if the enemy is to be driven from the air by America and her allies. Do the casualty figures really show that the men who fly bombing and fighting machines encounter no more risks than infantry officers in the trenches? Again is not more skill required of the bombing or fighting aviator than of the infantry officer? The aviator whose duty it is to reconnoitre manifestly does not gamble with death as his more daring comrades do. Would it not be logical to give the latter extra pay?

There is another consideration. It may be reiterated a thousand times that flying at the front is not more dangerous than holding, or fighting in trenches, but the average man cannot be convinced by the casualty lists. Offer him less pay than a First Lieutenant on the ground, who receives $2,000 a year, (not counting the extra percentage for foreign service,) and only $100 more than a Second Lieutenant and his enthusiasm for the Aviation Service will surely wane. Does he not read of fatal aeroplane accidents at home where there is no bombing or fighting to shake the flying man's nerve? Sometimes the victims are old hands at the game, too. Does he not hear that sooner or later the enemy "gets" the "aces" at the front, and that the fighting airman is lucky to retire with a "blighty" wound? The statistics of risk may be scientific, but give a man his choice of fighting on the ground or in the air and, unless he is an uncommonly daring spirit, he is quite willing to stick to terra firma and let somebody else yield to the fascination of flying. Therefore, it would appear that extra inducements must be offered if a full complement of officers is to be obtained for the American Aviation Service.

It may be suggested that the pay of the flying men be graded in proportion to the hazard of their work. As to the question of extra allowances, it is a condition that confronts the War Department; it needs men of skill and courage and will have to pay for them. The present schedule may err on the side of liberality. A First Lieutenant who obtains a rating as a military aviator receives, it has been said, the pay of a Captain, ($2,400 a year,) and this is increased by 50 per cent extra for regular flying and another 20 per cent for foreign service to $4,000 which is the pay of a Colonel. If that is true, it is no wonder the deeps are murmuring Pay and allowances are excessive in this case. A compromise is in order. It should not be difficult to arrange a just and reasonable schedule for aviators. A rate of $150 a month, even for a Second Lieutenant, if his business is to fly, cannot be commended as a "square deal."

Aeroplane Service to Washington

(Editorial in *N. Y. World*)

A CALL for bids by the Post Office Department makes it certain that before summer comes regular daily mails will be borne by aeroplane between New York, Philadelphia and Washington.

Until now our aero-mail routes have been in regions where ordinary carriage is difficult, as over a mountain range into Alaska or following Pershing into Mexico. Now the busiest mail route in America, connecting the homes of millions of people, will thus be supplemented.

The army is to release motors for the new planes. They must, in test, carry 300 pounds for 200 miles without stopping, climb 6,000 feet in ten minutes and travel from 45 to 100 miles an hour. These conditions are easily met.

Merchants who are annoyed by mail delays due to train blockades will gladly pay the proposed extra rate for fast service. But the Government itself may be the chief patron of this swift communication between the war offices and the great factories along this coast.

This experiment may soon be extended to New England factory regions. Draw a line from Boston to Washington; within a few miles of it live close upon 20,000,000 people, whose commerce, industry, and scale of living make them the chief source of mail matter upon a small area in the world. It is in this important district that postal air routes are to have their fitting trial.

Mails Through the Air

(*Editorial in N. Y. Globe*)

WITH the establishment of air mail service between Washington and New York another wonder of the world will have been made ordinary. But yesterday Professor Langley was seeking to convince a generation unfamiliar with the possibilities of natural laws that heavier-than-air machines, not inflated balloons, offered the only means of flying. Close upon his heels followed the practical demonstrations of the Wright brothers, while an incredulous world still gaped at the huge contrivances Count Zeppelin was floating over Lake Constance with maddening effect on the excitable brain of the kaiser. The war that scrapped the gas-bag established scientific aviation as an ordinary means of locomotion, destined in peace times to revolutionize our means of getting about and overcoming obstacles.

Not exactly unexpected, therefore, is the postmaster's announcement that in the spring our letters to and from the capital are to travel overhead at the rate of a hundred miles an hour. Yet it is extraordinary when we recall that only four years ago every ascension in the air seemed attended with grave risk of disaster. It was the exigencies of battle, of course, that compelled men to disregard the hazard and devote themselves solely to all conceivable uses of the flying machine for the purposes of war, and so accomplish in a year or two what would hardly have been done in a decade under normal condition.

Thus it is that Mr. Burleson is able to make known the prospective opening of a mail service with as much certainty as he would feel if he were telling of mail transfer by fast train service. Like the fliers themselves and the public that reads of their exploits, he has become so accustomed to flying as one of the means of swift movement that any proposal for air transit seems natural and feasible.

Important advantages will be secured. The saving in time should be material, probably 60 to 70 per cent. Delays should be avoided altogether. In the transmission of government orders and instructions in war time these gains should be of great value.

The Fatal Hour

"ONE bright day this coming spring the fate of the last great battle will be decided—in the air." Thus M. Lasies, Deputy for Paris, an authority in the real sense of the term whom we have before had occasion to quote. Prophecy is a thankless task, in war even more so than in other matters mundane; but the war has so far run its course that we may safely accept the pronouncement quoted as true prophecy.

Of two things one. Either the war on the vital Western front will resolve itself once more into strategic battles of movement, as seems highly probable; or the quasi-immobile trench warfare—the deadlock of the trenches as it has been inaptly termed—will prolong its weary course. In either event aviation will supply the deciding factor. This is no mere figure of speech; it is stark reality and none the less vital because it has not yet been grasped even remotely by the nation or its leaders.

The function of the Air Service this coming spring and summer will differ according to the character assumed by land warfare. If movement returns then there will be one sharp decisive struggle in the air; one or other opponent will be wiped out of the sky and will thenceforth be blind. That this is possible events during the course of the war have repeatedly shown, though hitherto in a limited degree. Once one army has been blinded its opponent will sweep onward, victorious, with all-seeing eyes. But let us clearly perceive this one supremely important fact: Without clear aerial supremacy—mere superiority is not enough—there can be no "break through."

In the other event, if we assume that the great wall in the West will stand the battering, that a year hence the line of trenches will still extend from the coast of Flanders to the Alps, then again the Air Service will supply the deciding factor, though in different fashion. It will be the heyday of the bomber. Within hundreds of miles of the lines not a depot, store, dump or factory will be secure either by night or by day. There will be a systematic attempt on a vast scale to destroy the enemy's resources and his manufacturing power so as to put him definitely out of the war.

If the coming spring is to supply the decisive phase of the war, as many think it will, it is certain that aircraft supremacy alone can bring about that decision, other things being equal.

But it is not enough that this fundamental truth should be grasped; it is not even enough that it should be acted upon. *It must already have been acted upon.* It has frequently been pointed out in these columns that a large productive program in aircraft construction has to pass through initial preparatory stages which necessarily consume some months of precious time. In an industrial development of this magnitude improvisation is impossible. Plans have to be elaborated and carefully laid months in advance.

And we are now rapidly nearing the last days when our efforts can for good or ill affect the course of events this coming spring. The whole resources of the nation must without an instant's delay be turned over to aircraft production; that and shipping are our vital needs. Before these needs all else pales into insignificance.

If we insist on this point, it is because we fear even now the decisive influence of aircraft on the issue of the war has not yet been grasped and that the full manufacturing capacity of the country is not yet being utilized.—*Aeronautics,* London.



THE NEWS OF THE WEEK



Baker Lifts Ban of Secrecy

Secretary Baker has issued an order lifting the ban of secrecy from all matters connected with the award of contracts for supplies for the military establishment in the five purchasing branches of the War Department—the Engineers, Quartermaster, Ordnance, Signal Corps and Medical Department.

The order signed by the Assistant Secretary of War reads:

"The Secretary of War directs that hereafter the practise be adopted of freely making public the names of all contractors for military supplies."

The order marks a radical change in Mr. Baker's policy and shows clearly that he recognizes the mistake he made in demanding secrecy months ago. It now has been found that the practise of secrecy did not result in regulation of prices advantageous to the Government, nor did it serve to deceive the enemy by guarding this supposed military information.

The Aero Mail Proposal and Specifications

In our last issue we announced that Postmaster Burleson had issued proposals and specifications for the first aero mail route. The advertisement calling for the bids was as follows:

CIRCULAR—PROPOSAL
POST OFFICE DEPARTMENT

OFFICE OF THE PURCHASING AGENT
WASHINGTON

February 11, 1918.

Sealed proposals, subject to the usual conditions, will be received at this Office until 2 o'clock p. m., February 21, 1918, at which time and place they will be publicly opened, for furnishing and delivering f.o.b. factory the articles named below.

Bidders have the right to be present, either in person or by attorney (Sec. 63, P. L. & R.; Sec. 3710, R. S.), and to examine and inspect all bids (33 Stat. L., 440).

The Department reserves the right to reject any or all bids.

Proposals must be signed by the bidder, and inclosed in the accompanying envelope.

J. A. EDGERTON,
Purchasing Agent.

The specifications are as follows:

The Purchasing Agent,
Post Office Department.

In accordance with the above advertisement, inviting proposals for supplies, and subject to all the conditions thereof, the undersigned propose to furnish and deliver the articles below specified, F.O.B. factory, at the prices set opposite each article, and within the time specified.

Price for each item must be specified as well as total amount of bid.

Five aeroplanes, complete, capable of carrying 300 lbs. of mail a distance of not less than 200 miles, non-stop, at a maximum speed full load of 100 miles, minimum speed full load 45 miles, climbing speed 6,000 feet in ten minutes, and equipped with Hispano-Suiza Motor, 150 H.P.

Also spare parts, as follows: one landing gear, complete; one complete set of wings, including center section and interplane struts; one complete set of lower wings; two propellers, each; one set of elevators; one set of stabilizers; two rudders; two fins; three tail skids, complete; three landing gear axles, each; two landing gear wheels, complete, per set of two; two rubber shock absorbers for landing gear, per set; two engine beds; two engine bed plates; two radiators with fittings.

The parts mentioned to conform to the specifica ions for the aeroplanes to be furnished.

The contractor will be required to build and hold in reserve a sixth aeroplane of the same dimensions; to detail to the Post Office Department for three months one satisfactory supervisory official and to try out under the direction of the Post Office Department such suitable aviators and aeroplane mechanics as the Department may need in the operation of the said aeroplanes.

Contract will be awarded to the bidder whose aeroplanes have stood satisfactory service test in the War or Navy Department; aeroplanes and parts to be delivered as may be designated by the Post Office Department, at New York, Philadelphia and Washington not later than April 25, 1918.

Successful bidder will be required to give bond.

The War Department will release a sufficient quantity of motors to equip this lot of aeroplanes.

The Hispano-Suiza motors specified are regularly equipped with Splitdorf magazines.

Aircraft Inventors Invited to Submit Ideas to Committee

The National Advisory Committee for Aeronautics issues the following:

All parties desiring to bring to the attention of the Government inventions pertaining to aeronautics, or suggestions for improvements of existing types of aircraft and their appurtenances, are requested to communicate with the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C., and to submit comprehensive outlines of the proposed devices, together with necessary drawings, data, and the results of tests, if tests have been made.

All such suggestions and inventions are considered confidential, and where devices or suggestions of merit are submitted they are referred to the proper officials with suitable recommendations.

A special subcommittee on engineering problems has also been organized to assist in the work of examining inventions submitted.

Attention is called to the fact that many devices and proposals are submitted by persons unfamiliar with the principles and practices involved, hence such parties desiring to submit plans or devices should, as far as possible, secure competent scientific and technical advice before taking the time of the officials of the Government in examining devices or plans which clearly violate scientific laws or are contrary to the best aeronautical practice.

Creel Employs Aircraft for Propaganda

In his report on the work of the Committee of Public Information, George Creel, its chairman, reports the use of aircraft by the Committee as an important phase of its work. The report states:

"An increasingly important part of the work in foreign countries is concerned with the distribution of our printed matter by aircraft. Bombardment planes, loaded with leaflets and pamphlets that carry the truth to deluded peoples, go regularly over the firing lines and far into the lands both on the eastern and western fronts. The success of the campaign depends, as a matter of course, upon the number of planes that we are able to employ, and I have made a request upon the War Department for such number of machines as will permit us to co-operate with the French in the formation of an escadrille."

Aero Club Aids Stricken Guatemala

Mr. Alan R. Hawley, president of the Aero Club of America, and several prominent members of the Club contributed toward a fund for the relief of Guatemala, which was transmitted to the President of the Republic, Sr. Manuel Estrada Cabrera. In his letter Mr. Hawley wrote:

"Sympathizing with you and your countrymen in the dire distress occasioned by the appalling catastrophe that has befallen your city and renedered homeless the thousands of persons and families who are now without shelter, we are anxious to offer you our most heartfelt assistance in this time of your need."

Among the list of contributors to the fund, in addition to Mr. Hawley, are Mr. Henry Woodhouse, Mr. R. U. Conger and Capt. Russell H. Millward.



Group of French aviators who have been maintaining Allied supremacy on the West front, being reviewed by General Petain in appreciation of their heroic work. (© Committee on Public Information)

New Air Board in France

The Aviation Department of the French Army has been reorganized and there has been created an Air Board of which the Minister of Munitions is President. Members of the board comprise the Under Secretary for Aviation, a representative of the Commander in Chief, and the heads of the various departments concerned.

An aviation program will be drawn up from time to time at general army headquarters and submitted to the Under Secretary for Aviation, who, in turn, will lay it before the new Air Board. After a careful study of the program his board will edcide the number of machines to be built and immediately award contracts for their construction.

G. Douglas Wardrop Lectures Before Trenton Engineers

Mr. G. Douglas Wardrop, the editor of AERIAL AGE, lectured before the Engineers' Club of Trenton. His comprehensive speech, dealing with all phases of aeronautic warfare, was greeted with enthusiasm by the Trenton scientists. Mr. Wardrop also addressed the Pierce School and Pierce Alumni Association of Philadelphia.

Augustus Post Enlightens Electric Engineers

Mr. Augustus Post, Secretary of the Aero Club and world-famed balloonist, who participated in the historic flight with Mr. Alan R. Hawley, from St. Louis, Mo., to "Somewhere in Labrador," lectured before the Pittsfield Section of the American Institute of Electrical Engineers. He addressed the electricians on the subject of "The Allies Message to America," in which he pointed out the great need for cooperation and for filling the urgent aerial demands of our Allies, in order that the supremacy of the air may be maintained.

Silver Sales Convention

The annual convention of the Silver Company, makers of the Bethlehem plugs, was held Friday and Saturday, January 4 and 5, at Bethlehem, Pa., in the home office. By far the largest quota of salesmen yet present at such a gathering were in attendance.

Mr. E. H. Schwab, president, addressed the assembly on the opening day with an educational sketch of the development of ignition along scientific lines. The great lesson drawn by Mr. Schwab, from his remark, was the fact that the day is here when spark plugs shall be bought and used in accordance with the type of car or aeroplane and character of engine.

On Saturday, January 5th, Mr. W. N. Davidson, sales manager, and Mr. W. H. Lumpkin, advertising manager, addressed the men. Subject discussed was the 1918 advertising campaign and the sales policy back of it.

It has been reported from an authoritative source that a scientific sales plan has been carefully evolved. The new daily plant capacity of 75,000 plugs is said to be the reason for concentrated sales effort backed with a tactful advertising campaign.

H. W. Biddle and C. L. Ughetti, the former supervisor of sales of the Champion Spark Plug Company, and the latter formerly in charge of the Indiana and Michigan territories for the same concern, have joined the sales forces of the Silvex Company. Mr. Biddle has long been well known in the line and his wide acquaintance and high standing will no doubt prove of value to the Silvex Company.

Army and Navy Aviation Schools Keep Growing

Another dormitory building is to be erected at the U. S. School of Military Aeronautics at the University of Texas. The building is to accommodate several hundred students, and will be constructed of brick.

The expenditure of approximately $750,000 is contemplated in plans for increasing the size of the aviation school at the Great Lakes Naval Training Station. The new buildings will be erected at Camp Perry, one of the winter camps west of the main camp.

New barracks have been completed at the School of Military Aeronautics, University of California, Berkeley. The new building will make unnecessary the use of the Hearst Mining Building for the use of aviation students, as heretofore, and all the men will be comfortably quartered. The new building is well lighted and supplied with furnace heat.

Moving pictures have been taken showing the activities of the school by the Mutual Company.

John B. F. Bacon, son of Ex-Congressman Mark R. Bacon, of Wyandotte, Mich., has been made an instructor in the U. S. School of Military Aeronautics at Berkelely, Cal. He is a recent Yale graduate and a brother of Milton Bacon, who gained distinction last summer during his course at the duPont School, near Wilmington, Del.

Government to Take Over Long Beach Hotels to House Aviators

Officers of the Aviation Corps are arranging to take over most of the hotels, garages, and bathing house at Long Beach, L. I., to provide sleeping quarters for approximately 2,000 men who cannot be accommodated at the aviation field and camp at Mineola, L. I. Nearly all the places it is proposed to use are now closed, and it is understood that the War Department will have use of them until May 1. The Nassau Hotel, at which some of the officers will have their headquarters as guests, will not be included in the arrangement. While it is the intention to quarter the men in these various places, they are to have a central dining hall, under the direction of the corps.

General March Is Detailed Acting Chief of Staff

The Secretary of War authorizes the following:

Maj. Gen. Peyton W. March will return from service with the American Exepditionary Force, to become acting chief of staff.

Maj. Gen. John Biddle, assistant chief of staff, who has been acting chief of staff since the departure of General Bliss, the chief of staff, to serve on the Supreme War Council, will remain at the War Department temporarily, but will probably soon return for service with the overseas forces.

Rear Admiral Fisk Heads Army and Navy Club

At a meeting of the governors of the Army and Navy Club, of New York, Rear Admiral Bradley A. Fisk, U.S.N., was elected president. This is the first time a naval officer has held this office. Gen. Oliver B. Bridgman, N. G., N. Y., was elected first vice-president; Col. M. C. Martin, U.S.A., second vice-president; Maj. W. T. Romaine, U.S.V., secretary, and Lieut. R. C. Lawrence, treasurer.

$2,000,000 for Buildings for Aircraft Construction

Bids will be opened at the Bureau of Yards and Docks on February 21st for three large buildings for construction of aircraft, as an extension to the Navy Aircraft Station in Philadelphia. One building will be constructed with steel frame, concrete floor and brick walls, and two will be of reinforced concrete. The estimated cost is more than $2,000,000.

Quarter of a Million for Air Bombs

Among the leading items forthe army in the $1,000,000,000 Urgent Deficiency Appropriation Bill, the largest of its kind in the history of Congress, favorably reported to the House, are $277,732,000 for bombs for aeroplanes. Another $100,000,000 is asked for storage plants, while most of the remainder is to go for artillery.

To complete the storage at Governor's Island, N. Y., $2,000,000 is asked, while a storage house at Newark, N. J., will cost $4,600,000. Storage houses have already been built at Harrison, N. Y., and Norfolk.

Although the Navy Department has asked for $7,140,000 for improvement and equipment of navy yards for ship construction, the bill allows only $1,570,000 in addition to the $18,000,000 appropriated for that purpose.

Castle Killed Making "Immelman Turn"

Captain Vernon Castle, of the Eighty-fourth Royal Flying Corps Squadron, was killed at Benbrook Field, fifteen miles west of Fort Worth. Officers who witnessed the accident say that Captain Castle was flying at great speed when he came directly in the path of another aviator, who was just rising. Captain Castle tried what is known to aviators as the Immelman turn, which consists of a dive and a turn.

Captain Castle came back to the United States last October, after making 150 flights over the German lines. He was very popular at Benbrook Field and his flights in practice were invariably most spectacular and daring.

Secretary Baker Makes Public Reorganization of War Department

Secretary Baker's plan for the reorganization of the General Staff of the Army, with a view to a more efficient and consistent development of the war program was made public by the War Department. Major-General McCain has been instructed to issue an order putting the reform into effect.

The reorganization of the General Staff contemplates the establishment of five divisions of the staff, each of which will be presided over by an officer serving under the direct control of Maj. Gen. Peyton C. March, who is coming from France to take up his new duties as Acting Chief of Staff.

The new divisions will be as follows:

1. An Executive Division under an executive assistant to the Chief of Staff.
2. A War Plans Division under a Director.
3. A Purchase and Supply Division under a Director.
4. A Storage and Traffic Division under a Director.
5. An Army Operations Division under a Director.

All of these are to be assistants to the Chief of Staff.

Under the order chiefs of all bureaus, corps, and other agencies of the military establishment are instructed to communicate directly with the heads of the staff divisions upon matters as to which the latter have control, and the division heads are authorized to act for the Secretary of War and Chief of Staff in such matters.

The order emphasizes the authority of the Chief of Staff, who, with the War Council, is the immediate adviser of the Secretary in all questions relating to the military establishment.

"The planning of the army program in its entirety," says the order, "the constant development thereof in its larger aspects, and the relation of this program to the General Staff and the entire army will be the duty of the Chief of Staff and the War Council."

There are reports in army circles that Edward R. Stettinius, recently made Surveyor General of Supplies under the Purchase and Supply Division of the General Staff, soon may be made a general officer and chief of that division. The office now is held by Brig. Gen. Pierce.



Girls operating machines used to automatically attach rib reinforcements.
(© Committee on Public Information)

NAVAL and MILITARY AERONAUTICS

American Air Forces in France

Enemy aviators were very busy, says an Associated Press dispatch from the American headquarters in France, dated February 11, taking photographs of American positions on the Western front. The clear atmosphere was favorable for observations, and several air fights resulted. One group of three enemy aeroplanes flew so low that they became targets for anti-aircraft and machine guns, and were driven off.

Corporal Thomas Hitchcock of Long Island, New York, and W. A. Wellman of Cambridge, Mass., American aviators in French escadrilles, have received $100 prize money each from the Lafayette Flying Corps Committee in recognition of their brilliant exploits in bringing down three German machines in the last six weeks. Hitchcock accounted for two and Wellman for one. These aviators have won also the French War Cross with palms and a spcial ten days' leave in Paris.

Corporal Hitchcock, who celebrated his nineteenth birthday this week, has just made application for a commission in the Aviation Corps of the American Army, for which he had been previously ineligible because he was under age.

Wellman, who is 26 years old, had been rejected by the American forces on physical grounds, although he is now regarded as one of the best American flyers at the front.

Stephen Thompson, son of N. S. Thompson, of San Marcos, Texas, brought down a German machine in his first flight over the German lines. He never had operated a machine gun before while in flight.

Thompson accompanied a French aerial squadron on a bombing raid over the German city of Saarburg. After dropping their bombs, the machines were attacked by a German defensive squadron. Lieutenant Thompson, in order to operate his gun more effectively, took off his gloves, and when an enemy machine came in range, he turned a stream of bullets into the enemy. Before the first drum was exhausted, the enemy machine toppled and started to spiral. Then it flopped and fluttered down with a flare of smoke and flame in its wake, and crashed to the ground a short distance from Saarburg.

Corporal W. H. Tailer, of Roslyn, Long Island, who was awaiting a commission in the American Air Service, was killed in an encoutner over the German lines. Tiler enlisted in the Lafayette Escadrille, after training at Avord, Tours and finally at Pau. But a few months ago he was transferred to the Aviation Corps of the regular French army, to that group known as Cigognes—a signal honor for the young American, for the Cigognes are crack combat fliers. Guynemer flew under this emblem. Tailer flew a 200 h. p. Spad one seater with a fixed machine gun.

Lufberry is learning the newest and most dangerous air stunt, "the falling leaf." In doing this stunt, the aviator lets his machine tumble downward exactly as a leaf drops from a tree. It combines most of the air antics known to fliers, excepting the "nose dive." Lufberry is credited with eighteen victories.

Lieut. Charles A. Hopkins, a well known Dartmouth runner and football player, was the victim of an aerial battle in France. Hopkins joined the Dartmouth Ambulance Corps and left for France last May. Learning of the need for aviators in our forces in France, he enlisted in the American air service.

A correspondent for the New York Globe and Chicago Daily News reports a visit to an American aviation center. "Some conception of the extent of the centre can be gained from the fact that it extends two miles along each side of a highway. A narrow gauge railroad passes straight through it. It will comprise three large aerodomes, a transportation park for thousands of automobiles, shops and barracks. Most of this is yet to appear. Instead there are acres of uncultivated ground, where American engineers work with battalions of Italian and Chinese workmen. Every spadeful of dirt turned there is helping to bring the day of victory nearer."

Special Orders No. 28

The following named officers are on duty requiring regular aerial flights from the dates set after their respective names: Second Lieut. Frank D. Reilly, 112th Field Artillery National Guard, December 5, 1917; Second Lieut. Guy R. Oatman, 354th Infantry, National Army, December 5, 1917; Second Lieut. William W. Ramsey, Delaware Infantry, National Guard, December 3, 1917; Second Lieut. Samuel R. Keesler, 324th Infantry, National Army, December 3, 1917; Second Lieut. George P. Johnson, 343d Field Artillery, National Guard, December 3, 1917; Second Lieut. Aloysius B. Alvey, 165th Depot Brigade, Infantry, National Army, December 5, 1917; Second Lieut. Earl T. Fairman, 343d Field Artillery, National Army, December 3, 1917, Second Lieut. John F. Keys, 316th Field Artillery, National Army, December 19, 1917; Second Lieut. Vivian L. Walker, 10th Depot Brigade, Field Artillery, National Army, December 5, 1917; Second Lieut. Henry M. Van Buren 114th Infantry, National Guard, December 19, 1917; Second Lieut. Lofton H. Stamps, 157th Depot Brigade, Field Artillery, National Army, December 19, 1917; Second Lieut. Fred C. Dawson, 113th Infantry, National Guard, December 19, 1917; Second Lieut. Ben H. Rice, Jr., Cavalry Reserve Corps, December 19, 1017.

Verbal orders of the Chief Signal Officer of the Army of January 28, 1918, assigning Second Lieut. George Randall Pierce, Signal Reserve Corps, to proceed to Dallas, Tex., are confirmed.

Second Lieut. Idwal H. Edwards, 50th Infantry, Camp Greene, Charlotte, N. C., is relieved from his present duty and will report at the School of Military Aeronautics, University of Texas, Austin, Tex.

Thomas Pelett Sandefur appointed first lieutenant to report at Rockwell Field, San Diego, Cal.

Second Lieut. Otis G. Clements, 59th Infantry, report to the School of Military Aeronautics, University of Texas, Austin, Tex.

The following named officers are on duty requiring regular aerial flights from January 11, 1918: First Lieut. Robert Moulton Briggs, First Lieut. Franklin Clay MacGuaghy, First Lieut. Felix T. Smith, First. Lieut. Victor Behling Westphal, First Lieut. Paul Kirkwood Yost.

Homer Darling Burch appointed second lieutenant report to the Chief Signal Officer.

Joseph Otto Freck appointed as second lieutenent report at Vancouver Barracks, Vancouver, Wash.

Frank Arthur Weaver appointed first lieutenant report at Vancouver Barracks, Wash.

Private First Class Donald E. Sias, appointed second lieutenant report at Rockwell Field, San Diego, Cal.

The following-named privates first class, Signal Enlisted Reserve Corps, appointed as second lieutenants: Dewitt Talmage Henderson, Jesse Keller Fenno, Clare Grafa report at Rockwell Field, San Diego, Cal.

Private First Class Robert Strong Worthington, appointed second lieutenant report at Rockwell Field, San Diego, Cal.

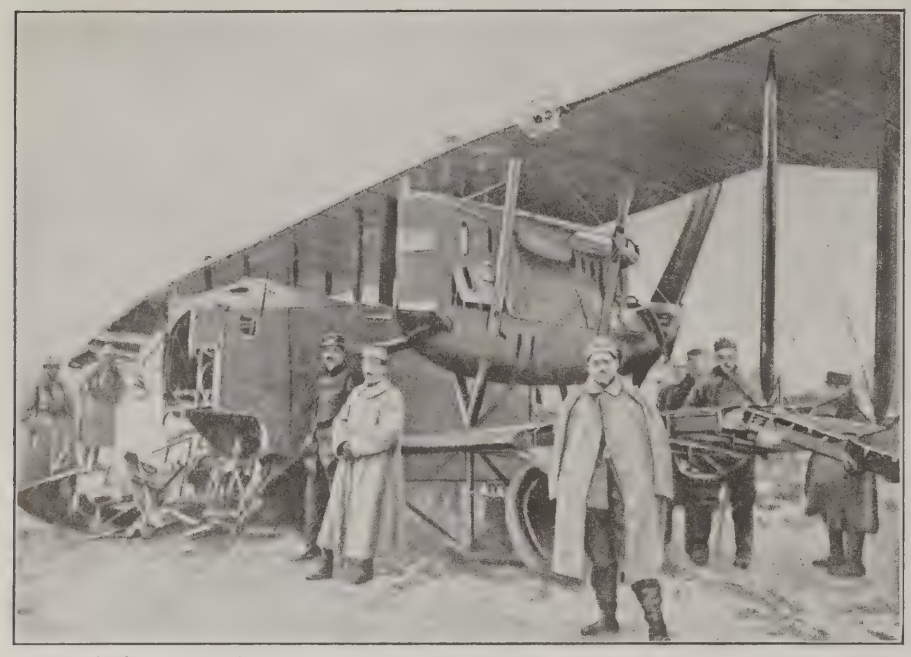
The following-named members of the O. R. C. appointed as first lieutenants: Henry Gay Andrews, Frederick Earle Edwards, Leo Fred Post, Eldridge Ted Spencer, report at Rich Field, Waco, Tex.

William Gibbon King and Cameron Wright appointed as second lieutenants, report at Kelly Field, San Antonio, Tex.

William Henry Hoff appointed as first lieutenant, report at Kelly Field, San Antonio, Tex.



Filling the fuel tank on a training machine in France. (© Committee on Public Information)



Giant Gotha biplane, having three cars, brought down almost intact on the French front. (Courtesy London Illustrated News)

The following-named members of the O. R. C. appointed second lieutenants: Gordon Lee Harwell, George Alfred Miller, Robert James Brown, Jr., Hugh Monroe Rice, Clifford Cameron Nutt, Jacob Marcellus Woodard, report at Ellington Field, Houston, Tex.

John Pugh Davies, Henderson Kenneth Franzheim, and Claude Francis Gilchrist appointed second lieutenants, report at Ellington Field, Houston, Tex.

James Garrett Ray appointed as first lieutenant, report at Gerstner Field, Lake Charles, La.

Private First Class William Hale Dayton, S. E. R. C. appointed second lieutenant, report at Rockwell Field, San Diego, Cal.

Hubert DeVault McLean appointed first lieutenant, assigned to duty with the 15th Aero Squadron, Long Island, N. Y.

Corpl. Thomas F. Egan, Signal Corps, appointed second lieutenant, report at aviation concentration camp, State Fair Grounds, Dallas, Tex.

George Monroe Brett appointed captain. Report to the Chief Signal Officer.

John Kennedy White appointed as captain Report to the Chief Signal Officer.

Donald Macy Liddell appointed captain. Report to the Chief Signal Officer.

The following-named members of the O. R. C. appointed second lientenants: Emil Shirley Anderson, Melvin Carl Aney, Charles Montgomery Commins, Hubert Stafford James, Russell Henry Klyver, Jesse Ward Simpson, Leslie Winstead Wishard, Vernon Blake Travellyan. Report to Gerstner Field, Lake Charles, La.

Lloyd Matthews De Shong and Rutledge Maurice Lawson appointed first lieutenants. Report at Gerstner Field, Lake Charles, La.

Raymond Warren Kearney and August Gottlieb Rehlmeyer appointed first lieutenants. Report at Love Field, headquarters staff, Dallas Tex.

Thomas Roy Evans and James Russell Worthington appointed as first lieutenants. Report at Rockwell Field, San Diego, Cal.

The following-named members of the O. R. C. appointed second lieutenants: Robert F. Goodyear, Maurice Francis Graham, James Edward Harrold, Arne Knud Bours Hoisholt, Clinton Jones, William Watson LaForce. Report at Rockwell Field, San Diego, Cal.

First Lieut. Chester Cotter, 339th Infantry, report at the School of Military Aeronautics, University of Texas, Austin, Tex.

Second Lieut. Herbert F. Thomas, Infantry, is detailed in the Aviation Section, Signal Corps (temporary), in the grade of first lieutenant. Report at Vancouver Barracks, Wash., for duty with the spruce production division.

Second Lieut. William N. MacKenzie, 314th Infantry, report at the School of Military Aeronautics, University of Texas, Austin, Tex.

First Lieut. Elmer M. Holmes, I. R. C., report at the School of Military Aeronautics, University of Texas, Austin, Tex.

Second Lieut. Charles A. Rooney, 3d Training Batttalion, 155th Depot Brigade, Camp Lee, Va., is relieved from his present duties. Report at School of Military Aeronautics, University of Texas, Austin, Tex.

Second Lieut. Alva W. Snyder, Infantry, report at School of Military Aeronautics, University of Texas, Austin, Tex.

The following-named first lieutenants, A. S. S. C., or S. R. C., on duty requiring regular aerial flights from the dates set after their respective names: Martin C. McMahon, December 27, 1917; Wiley R. Wright, January 9, 1918; Beverly V. Thompson, December 26, 1917; Arthur L. Foster, December 29, 1917; Harold Osborn, January 2, 1918; Samuel W. Harkins, January 5, 1918; Alander F. Hogland, January 5, 1918; Abner W. Shields, January 7, 1918; John W. Macready, January 16, 1918; David M. McClure, January 16, 1918; Ralph J. Johnson, January 15, 1918; Daniel E. Ellis, January 16, 1918; Louis E. Plummer, January 15, 1918; Gus P. Modlish, January 16, 1918; Manford F. Arnold, January 9, 1918; James H. Maupin, January 11, 1918; John U. Wegener, January 9, 1918; Ray L. Makin, January 17, 1918; Cecil H Braddick, January 17, 1918; Merrill K. Riddick, January 17, 1918; Maple D. Shappell, January 17, 1918; Edwin E. Newbold, November 20, 1917; John N. Thorpe, Jr., October 10, 1917; Donald P. Muse, August 16, 1917.

Special Orders, 29

First Lieut. Newton S. Frothingham, report to Park Field, Millington, Tenn.

First Lieut. Benjamin W. Estabrook, report to Love Field, Dallas, Tex.

Harry Graham appointed captain, report to the Chief Signal Officer.

Ralph Henry Matthiessen appointed first lientenant, report at School of Military Aeronautics, Massachusetts Institute of Technology, Cambridge, Mass.

John Julius Cadot appointed first lieutenant. Report at School of Military Aeronautics, Cambridge, Mass.

Franklin O. Carroll appointed first lieutenant. Report at Kelly Field, San Antonio, Tex.

James Frederick Ashenden appointed second lieutenant. Report at Taliaferro Field No. 1, Fort Worth, Tex.

The following-named members of the O. R. C., appointed second lieutenants in the A. S. S. C.: George William Anderson, Whitehurst Marsh Carner, Edwin Russell Clark, Harold James Forshay, John MacArthur, Kenneth Lee Porter, William Hazel Plyler, Joseph Christopher Raible, Jr., George Albert Satallo Robertson, Raymond Owen Seevers. Report at Taliaferro Field, Fort Worth, Tex.

Private James Gardner McNett, appointed second lieutenant in the A. S. S. C. Report at School of Aerial Photography, Langley Field, Hampton, Va.

Serg. William Augustus Barnhill appointed second lieutenant. Report at Fort Sill, Okla.

Verbal orders of the Chief Signal Officer of the Army assigning First Lieut. Jacob S. Sides, directing him to report to Colonel Bull, air personnel division, are confirmed.

Second Lieut. Van E. Rouse, National Army, report to School of Military Aeronautics, University of Texas, Austin, Tex.

First Lieut. George B. Helmle, report to the Chief Signal Officer.

Russell Gwilym Jones appointed first lieutenant report at Ellington Field, Houston, Tex.

Waldemar Hans Fries appointed first lieutenent, report at Fort Sill, Okla.

George Harold Pfau appointed second lieutenant, report to the Chief Signal Officer.

Chester Brunley Doubleday appointed first lieutenant report at aviation concentration camp, Garden City, Long Island, N. Y.

Second Lieut. Robert H. Kerr, report at School of Military Aeronautics, Georgia School of Technology, Augusta Ga.

John Sydney Owens appointed second lieutenant, report at Taliaferro Field, Fort Worth, Tex.

Wallace Arthur Rowell appointed first lieutenant, report at Kelly Field, San Antonio, Tex.

Martin Tucker Fisher appointed second lieutenant, report to the Chief Signal Officer.

Second Lieut. James L. Hamilton. Report at Hazelhurst Field, Mineola, Long Island, N. Y.

Second Lieut. George Franklin Eaten, report at Camp Taliaferro, Hicks, Tex.

Second Lieuts. Mark H. Redman and Harold G. Campbell, on duty requiring regular aerial flights.

First Lieut. Charles J. Glidden, relieved from duty as a member of the board of officers. Report at Army Baloon School, Fort Omaha, Neb.

Second Lieut. Clarence A. Livingston, proceed to Boston, Mass., and report to president of board of officers there, created in paragraph 27, Special Orders, No. 132, War Department, June 8, 1917, for assignment as a member of that board.

The following-named officers, Aviation Section Signal Reserve Corps, are on duty requiring regular aerial flights from the dates after their respective names: First. Lieut. George C. Johnson, January 8, 1918; First Lieut. James W. Lavers, January 8, 1918; First Lieut Leo J. Griffin, January 9, 1918; First Lieut. Theodore A. Straw, January 9, 1918; Second Lieut. Robert S. Olmstead, January 8, 1918; Second Lieut. Harvey H. Holland, January 10, 1918.

Maj. Cushman A. Rice, duty requiring regular aerial flights from November 21, 1917.

Second Lieut. Robert S. Cowan, 118th Field Artillery, report School of Military Aeronautics, University of Texas, Austin, Tex.

Wallace Baker Harwood appointed second lieutenant. Report at Kelly Field, San Antonio, Tex.

The resignation by First Lieut. Arthur M. Henderson, Signal Reserve Corps, of his commission as an officer in that corps is accepted by the President, to take effect this date.

Orders heretofore issued directing First Lieut. James William Cantwell, Aviation Section, Signal Reserve Corps, to report to the commanding officer, Kelly Field, for duty are amended so as to direct First Lieut. Cantwell to report in person to the commanding officer, Post Field, For Sill. Okla., for duty.

Second Lieut. Frederick Skinner Chichester, Infantry Reserve Corps, is relieved from his

present duty at Camp Meade, Annapolis Junction, Md., and will report March 2, 1918, at the School of Military Aeronautics, University of Texas, Austin, Tex., for a course of training and instruction.

The appointment on November 10, 1917, of Capt. Theodore Lyman, Aviation Section, Signal Reserve Corps, to captain in the Engineer Officers' Reserve Corps, with rank from August 28, 1917, is announced.

By direction of the President, the appointment of Second Lieut. Harvey S. Porter, 44th Infantry, to temporary first lieutenant, Signal Corps, Regular Army, with rank from January 26, 1918, is announced. He will proceed to Houston, Tex., and report to the commanding officer, Signal Corps Aviation School, for instruction in gunnery. The travel directed is necessary in the military service.

So much of paragraph 25, Special Orders, No. 291, War Department, December 14, 1917, as relates to the promotion of Second Lieut. Roland H. Rogers, National Guard of the United States, to rank from September 15, 1917, is rescinded, this officer having accepted commission in the Aviation Section, Signal Reserve Corps.

First Lieut. Archibald B. Johnston, Signal Corps, is announced as on duty requiring him to participate regularly and frequently in aerial flights from January 19, 1918.

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Private John Sumner De Camp, appointed second lieutenant. Report to the Chief Signal Officer.

Joseph Meadows Dawson appointed first lieutenant. Report to Park Field, Tenn.

Albert Hoevenhoff appointed captain. Proceed to Vancouver Barracks, Wash.

Jerry Thomas Illich appointed first lieutenant. Report Fort Sill, Okla.

William Nicholas DeWald and Theophilus Lee, Jr., appointed second lieutenants. Report at Kelly Field, San Antonio, Tex.

Privates Arthur E. Zipse and George Howell Burgess, S. E. R. C., appointed second lieutenants. Report to Ellington Field, Houston, Tex.

First Lieut. Edgar L. Vail, on duty requiring regular aerial flights.

Leslie G. Chandler appointed second lieutenant. Report to Kelly Field, San Antonio, Tex.

Appointments of the following-named members of the O. R. C., as second lieutenants in the A. S. S. R. C., are announced: Alfred Azel Adams, David Derden Bruton, Olin Caldwell Francis. Report to Kelly Field No. 2, San Antonio, Tex.

Second Lieuts. Abraham B. Thumel and Arthur Van Kirk Moniger, promoted to the grade of first lieutenant. Lieutenant Thumel report to aviation concentration camp and general depot, Garden City, Long Island, N. Y., for duty. Lieut. Arthur Van Kirk Moniger, report to Karlstrom Field, Arcadia, Fla.

George Marquis Sunday ordered to duty in his office.

The following-named officers, on duty requiring regular aerial flights from the dates after their respective names: First Lieut. Howard W. French, November 5, 1917; First Lieut. Alfred W. Redfield, December 24, 1917; First Lieut. James M. Bovard, December 24, 1917; First Lieut. Jean de St. Mart, January 15, 1918.

George Joseph Brew appointed second lieutenant. Report at Taliaferro Field No. 1, Fort Worth, Tex.

J. Thad Johnson appointed first lieutenant. Report at Park Field, Tenn.

Harris Clay Roberts appointed first lieutenant. Report at Kelly Field, San Antonio, Tex.

First Lieut. James Sloan, Signal Corps, will proceed to aerial concentration camp, State Fair Grounds, Dallas, Tex.

First Lieut. Isaiah Davies, report at Rockwell Field, San Diego, Cal.

Second Lieut. Henry Pascale, 3d Infantry, proceed to School of Military Aeronautics, University of Texas, Austin, Tex.

First Lieut. Edmund P. Gaines, on duty requiring regular aerial flights.

The following-named members of the O. R. C., appointed second lieutenants in the A. S. S. C.: Bryan Mann Battey, Kenneth Smith Clapp, Donald Brown Cole, George Raymond Cullman, Irving Pemberton Corse, Howard Rea Smith, William Hugh Shearman, Jr., Horace Shidler, Lawrence Theodore Wyly, George Thomas Wise.

Sergt. Michael Alton McKinney, Jr., appointed first lieutenant. Report at Langley Field, Hampton, Va.

Henry LeNoble Stevens appointed second lieutenant. Report at Taliaferro Field No. 1, Hicks, Tex.

Edwin DeWitt Ackerman appointed second lieutenant. Report to the Chief Signal Officer.

Daniel Brailey Gish appointed second lieutenant. Report at Taliaferro Field No. 1, Fort Worth, Tex.

Orders heretofore issued directing the following-named officers, to report to Kelly Field, South San Antonio, Tex., for duty are amended so as to read report to Fort Sill, Okla.: First Lieut. Claudius Womble, First Lieut. John Lee McCart, First Lieut. Frank Buckner.

Private Ferdinand William Sharen, 112th Aero Squadron, Signal Corps, appointed second lieutenant. Report to the Chief Signal Officer.

John Cummings Grier, Jr., appointed second lieutenant. Report to the Chief Signal Officer.

Private Elmer D. Mitchell, Signal Corps, appointed second lieutenant. Report Call Field, Wichita Falls, Tex.

Thomas L. Rouse appointed first lieutenant. Report at Kelly Field No. 2, San Antonio, Tex.

Private Charles Rosenbaum, appointed second lieutenant. Report to Capt. Paul B. Holmes, Packard Motor Car Co., Detroit, Mich.

Private Wellington Arnold appointed first lieutenant. Report Kelly Field, Tex.

First Lieut. Edmund Jerome Burke appointed captain. Report at Hazelhurst Field, Mineola, Long Island, N. Y.

Private Francis P. Petrott, E. O. C., N. A., transfered to A. S. S. C. Report to Langley Field, Hampton, Va.

Private George Walter Rogers appointed second lieutenant. Report to Camp Taliaferro, Fort Worth, Tex.

The following-named officers, A. S. S. R. C., report to place indicated after their respective names: Capt. William A. Tilt, Ellington Field, Houston, Tex.; First Lieut. Newton S. Frothingham, Park Field, Millington, Tenn.; First Lieut. Benjamin W. Estabrook, Love Field, Dallas, Tex.

Commissions and Promotions

The following appointments were made in the Officers' Reserve Corps on February 6th:

To be first lieutenants, Aviation Section, Signal Reserve Corps: Fred W. Belcher, 130 Bowles St., Springfield, Mass., John W. Cummins, 119 D St., N. E., Washington, D. C., Newt Frey, Langley Field, Hampton, Va., Childs Frick, Roland Park, Baltimore, Md., Guy E. Grantham, 1710 Pa. Ave., N. W., Washington, D. C., Climpson M. Knight, Post Field, Ft. Sill, Okla., Henry G. Mitchel, Jr., 1072 Peach Ave., Memphis, Tenn., Earl D. Stearns, 1624 Oliver Bldg., Pittsburg, Pa., William H. Thurston, Jr., 119 D. St., N. E., Washington, D. C.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Marion A. Baldwin, Army Balloon School, Ft. Omaha, Neb., Clifford H. Billett, Langley Field, Hampton, Va., Sealy J. Churchill, 5945 Belmont St., Dallas, Tex., Wayne Heisner Cory, College Park, Md., George R. S. Denton, Kelly Field, L. I., N. Y., James Rhodes Everall, Camp Wadsworth, S. C., Frank J. Howard, Garden City, L. I., N. Y., Alfred W. Marriner, 3127 Christiana Ave., Chicago, Ill., John R. Martin, Garden City, L. I., N. Y., Maurice C. Myers, Post Field, Ft. Sill, Okla., Theodore A. Peck, Post Field, Ft. Sill, Okla., John W. Schricker, Garden City, L. I., N. Y., Howard Smith, Langley Field, Hampton, Va., Graham Spencer, Garden City, L. I., N. Y., Sanford E. Williams, Army Balloon School, Ft. Omaha, Neb., Harley W. Zehner, Garden City, L. I., N. Y.

February 7, 1918

To be first lieutenant, Aviation Section, Signal Reserve Corps: Fred. DeW. Stevenson, 26 Broadway, New York, N. Y.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Herbert H. Balkham, Office, Chief Signal Officer, Washington., Kitchell M. Boorman, 1805 Kenyon St., Washington, D. C., Hugh A. Coulbourn, Ga. School of Tech., Atlanta, William H. Davis, 253 Union Station, Washington, D. C., Ralph J. Grover, Ga. School of Tech., Atlanta, Charles B. Martin, Ga. School of Tech., Atlanta, Ralph D. McLaughlin, Ga. School of Tech., Atlanta, Cyrus W. Merrell, Army Balloon School, Ft. Omaha, Neb., Joseph P. Moran, Ga. School of Tech., Atlanta, William H. Myer, 105 E. 15th St., New York, N. Y., George B. Post, Jr., Ga. School of Tech., Atlanta, Ga., Walter H. Rudolph, 15 Park Row, New York, N. Y.

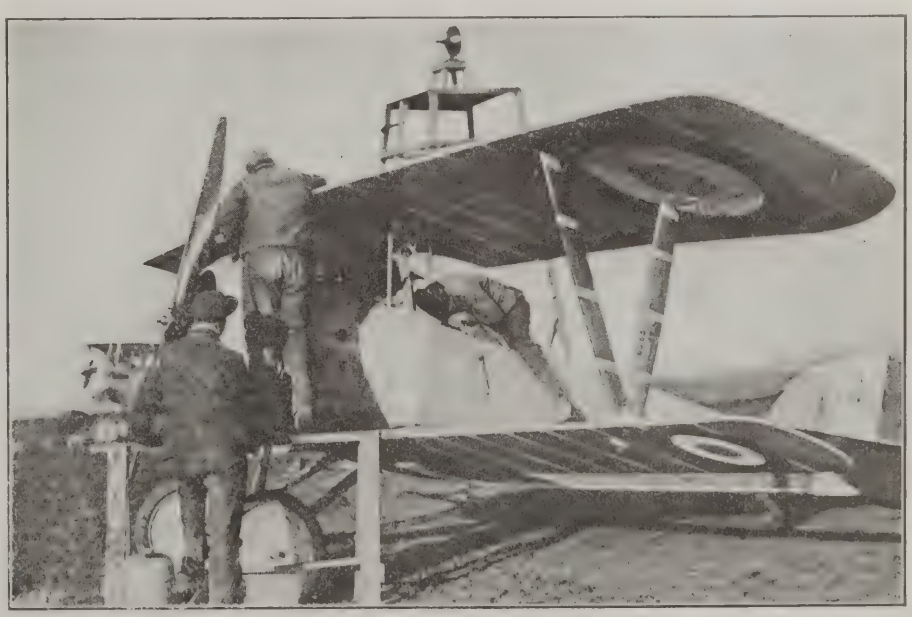
February 9, 1918

To be first lieutenants, Aviation Section, Signal Reserve Corps: Elston H. Bergen, Jr., Princeton Univ., Princeton, N. J., Charles W. Howard, 1836 Euclid Ave., Cleveland, O., William D. MacKeen, Dorr Field, Arcadia, Fla., Clifford E. Smythe, Army Balloon, Ft. Omaha, Neb., George J. Waters, 120 Broadway, New York, N. Y.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Guy E. Armantrout, Ft. Omaha, Neb., Hilding N. Carlson, Mass. Inst. Tech., Cambridge, Mass., Oscar L. Culley, Box 1671, Dallas, Tex., Warren K. Green, U. S. Weather Bureau, Washington, D. C., Albert L. Hill, A. Guthrie & Co., St. Paul, Minn., King H. McLaurin, 139 N. 2nd St., Duquesne, Pa., James O. Murray, Princeton Univ., Princeton, N. J., DeGrimm Renfro, Kelly Field, San Antonio, Tex.

February 11, 1918

To be lieutenant colonel, Aviation Section, Signal Corps, R. A. T.: William W. Montgomery, Jr., 119 D St., N. E., Washington, D. C.



Testing and tuning up a machine before flight. (© Committee on Public Information)



Nieuport monoplane, the fastest machine being used on the front, loaned by the French to the American Air Service. (© Committee on Public Information)

To be captains, Aviation Section, Signal Reserve Corps: William J. Roepke, 719 2nd St., San Diego, Cal., Miller R. Taylor, 600 W. 142d St., New York, N. Y.

To be first lieutenants, Aviation Section, Signal Reserve Corps: Ludwell B. Alexander, 1065 Merriweather St., Memphis, Tenn., William H. Boyce, 339 Iroquois St., Beaver, Pa., Robert B. Bridge, 34 Jackson St., Cape May, N. J., John B. Brock, 119 D St., N. E., Washington, D. C., Samuel L. Crumway, Bradford Woods, Wexford, Pa., Cecil K. Sherman, 102 Columbus St., Alexandria, Va., Carl E. Sullivan, 1813 Adams Mill Rd., Washington, D. C., William C. Trapp, 119 D St., N. E., Washington, D. C., Silas M. Wiley, 119 D St., N. E., Washington, D. C.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Norman B. Ames, Marian Ave., Clarendon, Va., Richard H. Anderson, Army Balloon School, Ft. Omaha, Neb., Howard B. Andrews, Ft. Omaha, Neb., Arthur H. Barry, Ft. Omaha, Neb., Ulysses H. Bonney, Ft. Omaha, Neb., Frederick L. Brown, 1032 16th St., N. W., Washington, D. C., Donald M. Burleigh, Ft. Omaha, Neb., Robert F. Cameron, Ft. Omaha, Neb., Savis T. Christian, Ft. Omaha, Neb., Anson L. Clark, Kelly Field, San Antonio, Tex., Roland R. Cummings, Ft. Omaha, Neb., Robert H. Finley, Ft. Omaha, Neb., Mason E. Franklin, Ft. Omaha, Neb., Maurice F. Gillern, Ft. Omaha, Neb., John S. Godfrey, Ft. Omaha, Neb., Myron B. Gordon, 423 Biddle Ave., Wilkensburg, Pa., Stanley W. Hahn, Ft. Omaha, Neb., Richard S. Harper, Ft. Omaha, Neb., Ruby F. Hatcher, Ft. Omaha, Neb., Roswell W. Henninger, Ft. Omaha, Neb., Edwin F. Hermanns, Ft. Omaha, Neb., William H. Holmes, Ft. Omaha Neb., Emil E. Hurja, 471 House Office Bldg., Washington, D. C., Don L. Hutchins, Ft. Omaha, Neb., Gordon F. Jacques, Ft. Omaha, Neb., John A. Jernigan, Post Field, Ft. Sill, Okla., Ray Lane, Ft. Omaha, Neb., John L. Lillienthal, 211 Stanford Ct., San Francisco, Cal., Blake R. McGinness, Ft. Omaha, Neb., Herbert H. Mills, Ft. Omaha, Neb., Hubert K. Owen, Ft. Omaha, Neb., Carl E. Peinze, Ft. Omaha, Neb., Chester Rainey, Yoen Bldg., Portland, Oregon, James N. Ramsey, Ft. Omaha, Neb., Harry E. Schellberg, Ft. Omaha, Neb., Henry D. Schmidt, 119 D St., N. E., Washington, D. C., John W. Shoptaw, Ft. Omaha, Neb., Lawrence G. Simpson, Ft. Omaha, Neb., Dewitt T. Spence, Ft. Omaha, Neb., Edward J. Verheyden, Jr., Ft. Omaha, Neb., Raymond T. Vredenburg, Ft. Omaha, Neb., Clarence H. Welch, Ft. Omaha, Neb.

February 12, 1918.

To be first lieutenant, Aviation Section, Signal Reserve Corps: John E. Burke, 870 Woodward Ave., Detroit, Mich.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Benjamin F. Betts, 354 Union Sta., Washington, D. C., Charles Gerlinger, Ft. Omaha, Neb., Merrill C. Horine, 1926 N St., Washington, D. C., Harry J. Kennedy, 112 Aero Squad., San Antonio, Tex., Leo Neidigh, 119 D St., N. E., Washington, D. C., James M. Royal, 4735 21st Ave., N. E., Seattle, Wash., Homer M. Stocking, 2641 Stevens Ave., Minneapolis, Minn., Morris H. Sugar, 580 W. 161st St., New York, N. Y., James M. G. Thompson-Neely, Ft. Omaha, Neb.

February 13, 1918

To be captains, Aviation Section, Signal Reserve Corps: Louis F. Bretey, 15 W. 64th St., New York, N. Y., George O. Draper, 32 W. 40th St., New York, N. Y., Elmer A. Eckman, 2017 H St., N. W., Washington, D. C., Joseph W. Roe, 401 Lindsey Bldg., Dayton, O., Fred I. Tone, c/o Major C. M. Hall, Dayton, O.

To be first lieutenants, Aviation Section, Signal Reserve Corps: Edwin DeW. Ackerman, 119 D St., N. E., Washington, D. C., George Scott, Q. M. Corps, San Diego, Cal., Walter S. Tower, 1023 16th St., N. W., Washington, D. C.

To be second lieutenants, Aviation Section, Signal Reserve Corps: William E. Conway, Jr., Kelly Field, Tex., James R. Ervin, Lincoln, Neb., George G. Lundberg, Ft. Omaha, Neb., Leo G. Pfaff, Ft. Omaha, Neb., Milton D. Sapiro, Ft. Omaha, Neb., Lester N. Stockard, Kelly Field, Tex., Richard E. Thompson, Ft. Omaha, Neb., Donald B. Wheeler, Quincy, Mass.

The following appointments, authorized by the Secretary of War, and made at the Military School of Aeronautics designated opposite each name, on the dates indicated, are approved.

To be first lieutenants, Aviation Section, Signal Reserve Corps: Hugh A. Bivins, Gerstner Field, La., January 29; William B. Cowart, Rockwell Field, Cal., Jan. 23; Athol A. Dawson, Rockwell Field, Cal., Jan. 19; Frank B. Dudley, Gerstner Field, La., Jan. 29; Harold J. Edgar, Gerstner Field, La., Jan. 29; Ray W. Garretson, Rockwell Field, Cal., Jan. 23; John J. Goodfellow, Jr., Rockwell Field, Cal., Jan. 23; George V. Grey, Gerstner Field, La., Jan. 29; Burton F. Lewis, Park Field, Tenn., Jan. 31; Jacob E. McKean, Gerstner Field, La., Jan. 29; Harold McKnight, Gerstner Field, La., Jan. 19; Elmer E. Nichols, Rockwell Field, Cal., Jan. 19; Joseph R. Pearson, Jr., Gerstner Field, La., Jan. 29; Glenn F. Russ, Kelly Field, Tex., Jan. 25; Thomas R. Scott, Gerstner Field, La., Jan 29; Reginald W. Whitney, Kelly Field, Tex., Jan. 28; Walter M. Wotipka, Gerstner Field, La., Jan. 29.

To be second lieutenants, Aviation Section, Signal Reserve Corps: Wilbur T. Brown, Rockwell Field, Cal., Jan. 21; James H. Clark, Gerstner Field, La., Jan. 20; Paul D. Coles, Rockwell Field, Cal., Jan. 23; Paul O. Davis, Kelly Field, Tex., Jan. 19; Ben A. Sweeney, Kelly Field, Tex., Jan. 28.

School of Military Aeronautics, Rockwell Field, Cal.: Bernard M. Doolin, Jan. 21; Arthur Fairchild, Jan. 24; John T. Fancher, Jan. 21; Richard Goodman, Jan. 23; John L. Hofflund, Jan. 21; Paul E. Lakin, Jan. 24; Raymond J. Little, Jan. 22; Frank Luke, Jr., Jan. 23; Robert J. Mitchell, Jan. 21; John H. Robinson, Jan. 23; Alfred M. Southard, Jan. 21; Bruce Struthers, Jan. 21; Leonard Sullivan, Jan. 21; John B. Swem, Jan. 23; Paul Valle, Jan. 21; Andrew Warrum, Jan. 21; Harold R. Wells, Jan. 23; Roe E. Wells, Jan. 25; Roy W. White, Jan. 21; Ernest J. Peterson, Jan. 21.

School of Military Aeronautics, Taliaferro Field, Tex.: Alfred B. Baker, Jan. 28; Frank S. Ennis, Jan. 28; Edwin T. Harman, Jr., Jan. 28; James A. Healey, Jan. 28; Edwin R. Kingsland, Jan. 28; Peyton C. March, Jr., Jan. 28; Edward M. Morris, Jan. 28; Ivan A. Roberts, Jan. 28.



Off for a flight over the German lines in a photograph machine. (© Committee on Public Information)

Farré Paintings to be Exhibited in New York

It was announced at the Aero Club of America that an exhibition of 140 official aeronautical paintings will be shown at galleries in all the large cities of the country by the French, British and American military authorities, beginning March 9. Mrs. William Astor Chandler is chairman of a committee arranging this exhibit. The pantings will include many of those made at the fighting front by Henri Farré, French official army and navy artist.

Record of German Aviators Who Have Been Killed in France

Thirty German aviators, who, according to the enemy "scoring system," had brought down a total of 479 French and British aeraplanes, have been killed during the past years, according to information obtained from German newspapers. The list, whith the number of victims credited to the pilots, follows:

Lieut. Werner Voss. 47; Capt. Boelke, 40; Lieut. Wolff, 33; Lieut. Schaefer, 30; Lieut. Almenroeder, 30; Lieut. Richthofen (not Baron Richthofen, who is also a German flyer), 24; Lieut. Wintgens, 18; Lieut. Baldamus, 18; Lieut. Frankel, 17; Lieut. Max, 14; Lieut. Dassembach, 14; Sub. Lieut. Nathaniel, 14; Sub. Lieut. Festner, 12; Sub. Lieut. Pfieffer, 12; Lieut. Manschott, 12; Lieut. Hohndorf, 12; Lieut. Arigi, 12; Lieut. Tutschaat, 12; Lieut. von Kendall, 11; Lieut. Kirmaier, 11; Lieut. Theiller, 11; Lieut. Serfert, 11; Lieut. Thulzer, 10; Capt. Behr, 10; Lieut. Leffers, 9; Lieut. Schulte, 9; Lieut. Parschan, 8; Sub. Lieut. Schillings, 8; Second Lieut. Immelmann, 6, and Lieut. Reisinger, 4.

AERIAL COMBAT

AERIAL combat is not in itself a necessity to modern warfare, but is simply an offshoot of the other branches of military flying:—aerial observation, contact patrol, and bombing. Indeed, as a noted French lieutenant remarked, at the beginning of the war, little thought was given to the subject of fighting in the air, as flying in itself was considered sufficiently dangerous, and when a German met an Allied airman, he either greeted him with a wave of the hand, or a shake of the fist, as his feelings would permit. The first weapon to be carried aloft by an airman for the purpose of aerial combat was a shot-gun. This was followed by an automatic pistol, and the process was continued until we have the heavily armored fighting planes of today.

Fighting in the air is not the haphazard thing that the layman would imagine, but consists in manoeuvers which are planned ahead—manoeuvers to which the best war brains of the combatant nations are put. There are three advantages open to the fighting pilot. They are:

1. The *Technical* advantage.
2. The *Strategical* advantage.
3. The *Personal* advantage.

The technical advantage consists of three things:

1. The machine,—speed, climb, and manoeuvering ability.
2. The armoring, or protection.
3. The number, and efficiency of guns mounted.

The strategical advantage naturally rests with the plane possessing the largest technical advantage, enabling the pilot to take advantage of natural conditions, in the knowledge that his machine can outmanoeuver and outshoot that of his adversary. All things being equal, it is obvious that the pilot with technical and strategical advantages naturally will have more confidence. But every fighting pilot *must* be an acrobatic flyer, and it would be foolhardy to send a man up in a scout machine if he could not do every stunt in the flying repertoire. The operation of his machine must be entirely instinctive, so that he will be able to give all his attention to the combat. The pilot must be able to pick an enemy plane from his own, out of range of its guns, and upon coming within range, must know the type, and the best means of fighting it successfully. Until the introduction of the German Gotha Type, the formula most often followed was an approach from the rear to a position under the tail of the enemy machine, in such a position that he (the enemy) cannot return the fire, *i. e.*, to get at his *blind spot*. The greatest natural advantage that can be employed is the sun. The sun, directly in a pilot's eyes does much to destroy his sight of an approaching plane. In addition, the clouds are found to possess natural advantages. It has been a favorite trick of aviators to hide behind a cloud, to swoop down on a plane below. The element of surprise gives the immediate superiority to the pilot, but if he does not use it successfully, the contest developes into one of flying ability, and gunnery. The advice generally given to a pilot surprised by the enemy is to do exactly as his adversary does. If the enemy plane mounts after him, the correct manoeuver is to mount also, in spirals, until such time as he can dive for superior position. If the enemy comes at him from above, he dives, afterward going up into a loop or a stall, allowing the enemy to pass directly under him, and then coming down on his tail. If neither pilot accomplishes a direct hit, the contest then develops into one of flying ability, where the best acrobat generally wins. In fact, there are numerous cases in which a pilot has compelled his adversary to surrender simply by wearing him down through his superior manoeuvering.



The Albatros, a single seater German combat machine.

Pursuit planes very seldom, if ever, go out singly. They usually go in formation, eight or ten of them, in the shape of an inverted V, with the leader of the escadrille out in front, and the three next best pilots in the apex of the V to keep watch behind, and spur those on directly ahead of them. If, when flying over the enemy lines, some pilot other than the leader observes a hostile machine, he flies to the front and for the duration of that combat takes the lead. The fight over, he falls back to his place.

Excellent gunnery will very often offset superior flying by the other pilot, and if an airman possesses both gunnery and flying ability, his advantage will naturally be greater. Boelke, and Immelman of the Germans, and Guynemer of the French were excellent gunners in addition to being superpilots, and very often brought down machines by a single burst from a distance of one thousand, and sometimes two thousand yards. As an aid to quick and accurate firing, Cadets at the American flying schools are being given a thorough training at trap shooting, in addition to their machine gun work.

The fighting pilot must, above all, learn to operate his machine as if it were a part of him, and his aerial manoeuvers must be a secondary thought. He must be able to know his own position in reference to the enemy, and his own lines at all times, for an aerial combat very often carries the fighters thirty and forty miles from the position in which they started. In addition to knowing how to attack, he must know how to get away, for machine guns very often jamb, leaving a pilot practically helpless if the combat were to be continued. And getting away is not simply a question of turning and heading for home with full power on, for this would offer a direct target for the gunner in the other machine. Probably the two most favored methods of escape are the side slip and the tail spin, for these are the positions in which a damaged machine, or one out of control, falls. The aeroplane in a tail spin present a very difficult target, and when the falling pilot believes he is out of range he can come out with great speed and get well on his way toward his own lines, at the same time being far enough below his adversary to present a difficult target. The side slip is generally done with the motor on, as a switching off of the power would indicate that the pilot is in control. The machine in a side slip falls almost as so much dead weight, and is very quickly accomplished.

As was stated above, before the introduction of the Gotha type of machine, the accepted formula to combat an enemy machine, no matter what the type, was to get under his tail, in his blind spot. But when the first Gotha was brought down and examined, the Allies saw the reason for the increasing number of their scout machines that were destroyed while enjoying what was thought to be the most correct position for the attack. Numerous methods of attacking the Gotha were tried but with little success. Necessity, however, is the mother of invention, and the following plan of battle was evolved from the experiences of the different pilots who had attacked Gothas. The rear gun, and the gun which shoots through the gun tunnel are both operated by the single gunner in the cockpit at the rear of the machine. This gunner shifts from one gun to the other as the case arises. Allied planes now come at the Gotha directly from the rear, but in a succession of short rises and dives. The consequence is that the gunner in the rear of the Gotha must keep shifting from one gun to the other, but never doing this with enough speed to sight his enemy. Or if he tries shots from each gun as his target comes into view, soon the magazine of one gun will become empty, or the gunner becomes temporarily "rattled." It is in this moment that the Allied aviator makes his supreme effort, and very often fires a full round during the few seconds that the other gun does not respond. If, however, his burst does not accomplish its purpose, he must make for home, as sooner or later he must get into range of one of the Gotha's other guns.

The prime requisite of the fighting pilot is *courage*:— not the blind courage that stakes all in one desperate frenzy, but the coolly calculating courage that permits the flyer to come directly into the position he has chosen, knowing that at any moment he may be sighted and greeted with a burst of fire from the enemy. The Americans flying with the French and British armies have shown this faculty, and there is every reason to believe that their reputation will be sustained by the thousands of young Americans now in training.

THE AERODYNAMIC LABORATORY AT LELAND STANFORD JUNIOR UNIVERSITY AND THE EQUIPMENT INSTALLED WITH SPECIAL REFERENCES TO TESTS ON AIR PROPELLERS.

By Professor WILLIAM F. DURAND, Chairman, National Advisory Committee on Aeronautics.

The aerodynamic laboratory at Stanford University was installed during the fall and winter of 1916-17. The immediate purpose in view was the provision of an equipment for the carrying on of an extended investigation on air propellers, the first stage of which was planned for the year 1917.

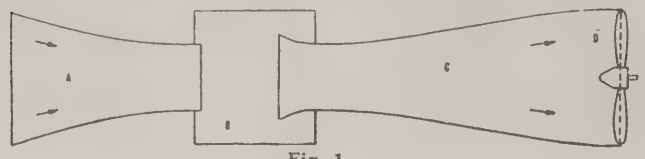


Fig. 1

AFTER due consideration, and with special reference to the facility of making observations, adjustments, etc., the so-called Eiffel type of wind tunnel was adopted. As is well known, this consists essentially of three elements as indicated in figure 1—the collector *A*, the diffuser *B*, and the experiment chamber *C*. At the end of the diffuser is located an exhaust fan *D*, which operates to draw the air from the diffuser and deliver it to the room in which the tunnel is located. This draft of air

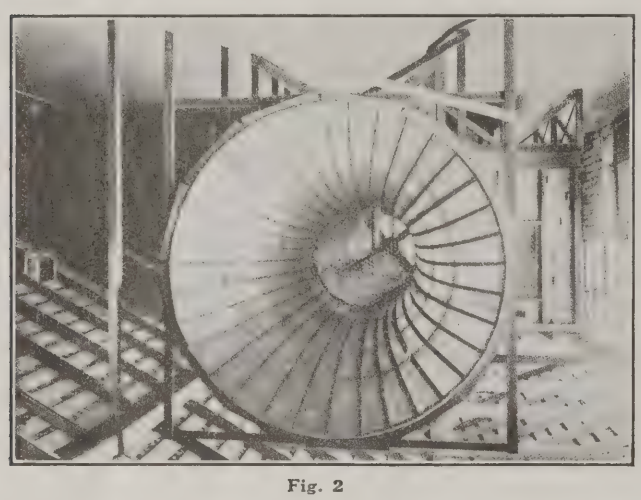


Fig. 2

from the diffuser may be viewed as producing a reduced pressure in the experiment room, which is practically air-tight otherwise except for the entrance through the collector. In answer to this depression (difference of pressure between the experiment room and that in the surrounding room on the outside), the air flows as through a nozzle, in through the collector, across the experiment room to the inner mouth of the diffuser, and thence on to the fan. The column of air thus flowing through the experiment room is then available for purposes of aerodynamic investigation.

The cross section was taken circular and the diameter of the throat was fixed at 5.5 feet as presumably suited to a propeller model 3 feet in diameter, a size large enough to give not too wide a step in passing by a law of comparison from model results to those for full-sized forms.

The principal dimensions, general arrangement, and structural details of the tunnel and experiment room are shown on the attached plans, Plates I and II, and figures 2 and 3.

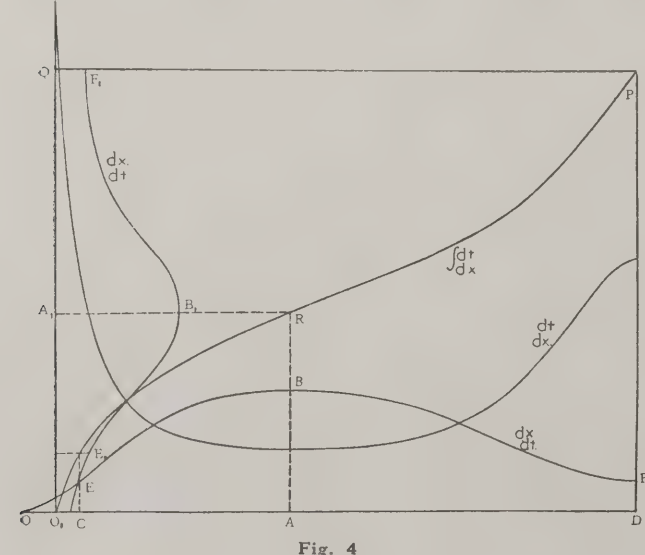


Fig. 4

Aside from structural details, the chief problem in the design of the twin tunnel related to the forms of the collector and diffuser. These were developed as follows:

Suitable lengths were first chosen for the collector and for the diffuser. These are indicated in figure 4, at *AC* and *AD* on the axis *OD*. The point *A* represents the throat of the Venturi tube at the experiment chamber. Then to a suitable scale the ordinate *AB* was laid off representing the the throat speed, say 60 miles per hour.

Neglecting the slight change in density along the path of the air, the entry and exit speeds will have one-four this value or 15 miles per hour. These are laid up as ordinates at *C* and *D*. A smooth curve was then drawn in through *EBF* and continued back to meet the axis CD at the point *O*.

The curve *OEBF* was then assumed as a graphical history of the air speed on distance, the part from *C* to *A* referring to the collector and the part from *A* to *D* to the diffuser. The curve *OE* for an axial distance *OC* may then be assumed to refer to the history of the velocity of the air outside the collector and during which it is accelerated from the low or inconsiderable speed of return to the speed of 15 miles per hour at *C*. It should be noted that the curve *OEBF* was laid in as a smooth continuous curve showing easy and gradual acceleration and retardation as distributed along the distance axis *CD*. It was then thought desirable to judge the same distribution of velocity but on a time axis. To this end the transformation indicated in the diagram was effected. Considering *OEBF* as a curve of dx/dt, the reciprocal of this curve was laid off as indicated giving a curve of dt/dx on an x axis. The integral curve of this was then run in as shown at O_1P giving x as a function of t, or t as a function of x. O_1Q thus becomes an axis of time t and the curve *EBF* of velocity on distance is readily transformed into the curve $E_1B_1F_1$ of velocity on time by the construction indicated. Any ordinate as *AB* is continued to the curve O_1P and from the point of intersection *R* an ordinate A_1R is drawn and from A_1 a distance $A_1B_1 = AB$ is set up giving the velocity at the time O_1A_1 from the assumed origin at O_1. A similar construction for the other points gives the curve $E_1B_1F_1$ as the time distribution of the velocity in passing through the tunnel, apart from the experiment chamber. The form of this curve was again considered by the eye, and between the two a final form of curve

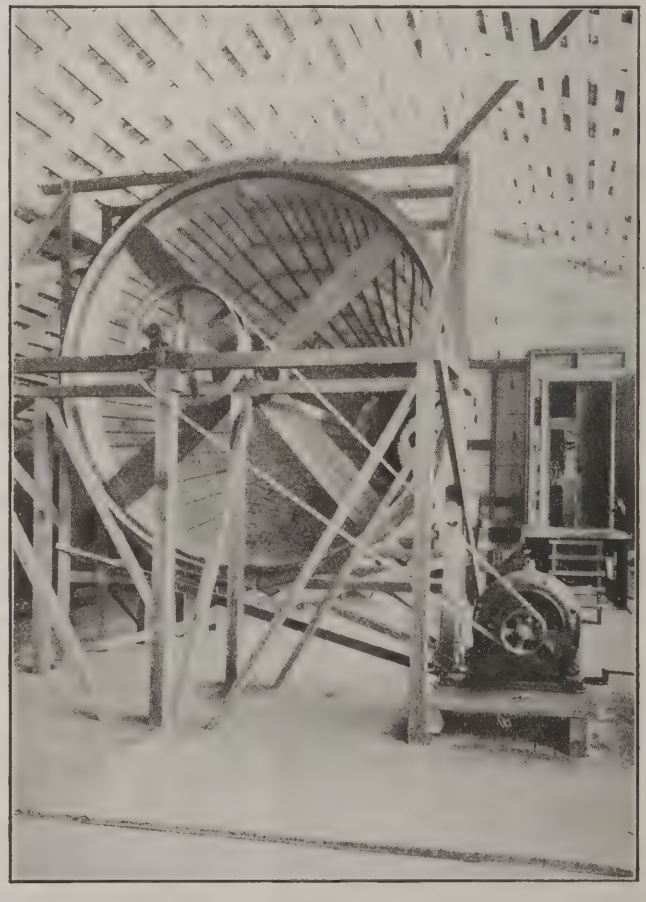


Fig. 3

for velocity on distance was chosen. Again neglecting change in density, these values of the velocity serve to determine the cross sections of the tunnel as compared with the section at th throat, 5.5 feet diameter.

Again considering the collector as a large nozzle into which the air is flowing as the result of a reduction of pressure in the experiment chamber and under the well-known laws for the flow of gases, it was found that the changes in density involved were too small to introduce any sensible change in the law of the distribution of velocity for the section areas assumed, or in the section areas for the velocities as shown by the accepted curve.

In this general manner the curves for the two parts of the tunnel

were determined. Actually, of course, the width of the experiment chamber intervenes at the throat point *A*, but this fact does not introduce any difference in the character of the curves as showing the presumptive history of the wind velocity on its way along the collector and the diffuser.

At the end of the diffuser and just before reaching the propeller exhaust fan, the form of the diffuser was slightly modified by bringing the curve of cross-section areas in slightly so that the areas are sensibly uniform just before reaching the fan location at the exit end of the diffuser.

In order to secure the desired uniformity in flow at the entrance into the chamber from the mouth of the collector, a honeycomb structure was built in the delivery end composed of hexagonal cells 3 inches in diameter and 10 inches long (fig. 5). These are of builders' roofing tin and are soldered at the edges forming a stiff and true structure with thin walls and presenting the minimum resistance to the flow of the air.

In order the better to collect the air at the entry end of the diffuser, an inward projecting flaring rim was fitted as shown in the drawings.

Propeller Fan

The exhaust fan at the outer end of the diffuser is of the propeller type, 4 blades, 11 feet in diameter and with a mean pitch of approximately 5.3 feet. The pitch is distributed on the Drzewiecki system assuming an advance of 4 feet per revolution with an angle of incidence of 3°. This gives values of the pitch on radius as shown in Table I. The form of blade contour, shape and character of blade sections, and mode of construction are all sufficiently shown by the drawing, Plate III.

TABLE I.—*Dimensions of fan propeller*

Radius.	Pitch.	Width of blade.	Maximum thickness.
Feet.	*Feet.*	*Inches.*	*Inches.*
1.0	4.50	11.0	2.50
1.5	4 60	11.5	2.05
2.0	4.74	11.8	1.66
2.5	4.88	12.3	1.55
3.0	5.05	12.3	1.35
3.5	5.24	12.3	1.25
4.0	5.40	12.3	1.07
4.5	5.56	12.3	.90
5.0	5.72	12.0	.75

The propeller fan is driven through a belt connection from a 20-horsepower constant-speed induction motor. Such changes in wind speed as are desired in the program of propeller tests are obtained by changes in the size of the drive pulley on the motor shaft. The

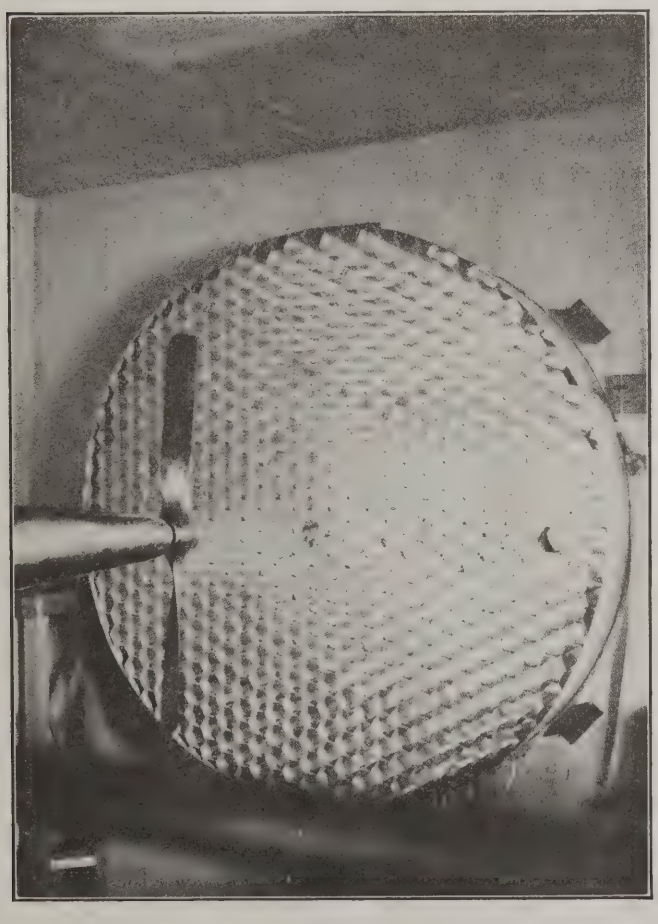


Fig. 5

general plan of the propeller tests contemplates sensibly constant wind speed for any given run of tests and variable revolutions of the test propeller. This permits a constant motor speed for the fan propeller for any given run of the model propeller with variations in slip and other conditions secured by varying the revolutions of the model propeller. In the actual tests as reported later, the runs were made approximately at two wind speeds, approximately 30 miles per hour and 40 miles per hour and corresponding approximately to 220 and 310 revolutions per minute of the fan propeller. In order to secure extreme slips, with the power available, certain propellers were also run with a wind velocity of about 20 miles per hour.

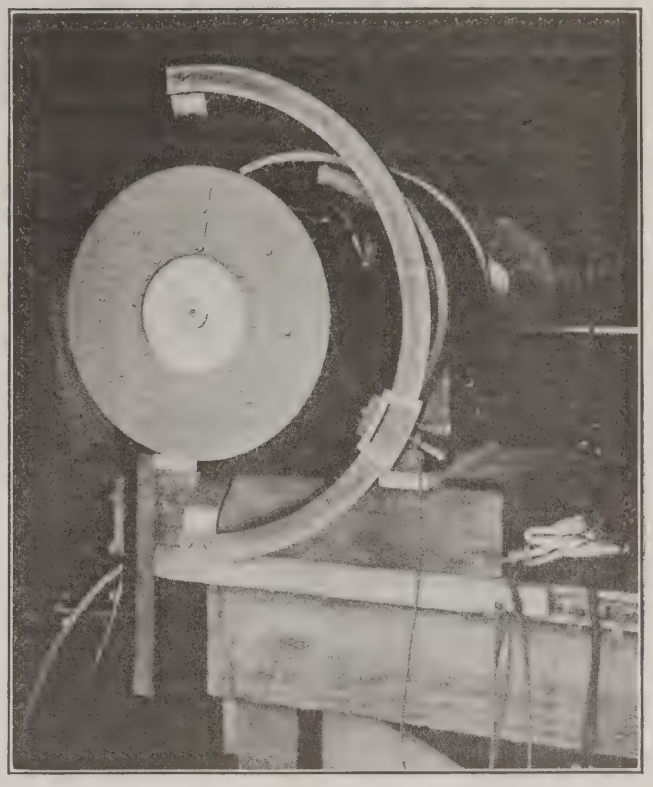


Fig. 6

Miscellaneous Details of Construction

No attempt will be made to give full structural details of the equipment. These must in any case be determined largely by the special circumstances of the case. A few of the more important structural fatures may, however, be noted.

The form of the collector and diffuser tubes was determined by circular frames made by nailing up a double ring of seven-eighths inch board segments, sawn to the proper curvature on one side, thus forming a strong ring of wood 1¾ inches thick. These rings were then fastened to uprights made of 2 by 4 inch scantling spaced about 2 feet between centers and so adusted vertically as to line up with the axis of the tunnel about 8 feet 9 inches above the floor of the room. These circular rings spaced out in this manner and each of appropriate diameter, give thus a series of transverse sections of the tunnel. The next step was to run longitudinal battens seven-eighths inch thick by 2 inches wide along the inside of these rings spacing them equally around the circumference. These battens were spaced about 6 inches between centers at the small end and double that amount, or 12 inches, at the large end. This entire framework when set up, cross braced, stayed to the building, roof and floor, made a very stiff and secure skeleton on which to lay the inner covering forming the shell of the tunnel itself. This covering was of a good quality of heavy cotton sheeting laid on and stretched with care and secured along each longitudinal batten by running on the inside a small aeroplane batten approximately one-fourth inch thick at the center by three-fourths inch wide, thus holding the fabric down on the large battens.

The fabric was then treated with a standard aeroplane wing "dope" (celluloid dissolved in acetone), varnished and rubbed down to a smooth finish. At the propeller-fan end for a distance of about 4 feet the number of longitudinal battens was doubled and for a distance of 1½ feet the inside of the tunnel was covered with galvanized sheet iron in order to give necessary stiffness in the immediate vicinity of the tips of the blades of the fan. This general procedure gave a tunnel with a smooth, true and fair surface, conforming to the law of cross-sectional areas as determined, and, as later test showed, stable and without sensible vibration or disturbance under the highest wind velocities employed.

The experiment room was made of matched boarding laid on the inside of joists and studding spaced about 18 inches between centers. The highest wind speeds contemplated were not much above 60 miles per hour, with a reasonable coefficient of flow through the collector tube this would require a reduction of pressure in the experiment room not much exceeding 10 or 12 pounds per square foot. This is a very moderate load, and no trouble was experienced in carrying it with ordinary framing covered with the matched boarding, as indicated. To give light in the experiment room, two window sashes were fitted and the glass was reinforced on the inside with supports, reducing the size of pane to the equivalent of about 9 by 10 inches.

The room was made practically air-tight by papering on the inside with heavy builder's paper laid on with a specially heavy paste. For entry and exit an airlock was provided with doors closing on suitable packing strips and fitted with self-adjusting hinges, allowing close contact between door and packing. With this general character of construction, the experiment room was readily made substantially air-tight and of strength sufficient to carry the load due to the excess pressure of the outer air above that maintained in the chamber.

Special Equipment

The special equipment for propeller testing comprises the following items:

Thrust dynamometer.
Torque dynamometer.
Revolution counter.
Air-speed meter.

(1) *Thrust Dynamometer.*

The general arrangement of this apparatus is shown in the drawing, Plate IV, and will be clear with a minimum of textual description. The general form of the apparatus was so designed as to place the propeller approximately 1½ diameters forward of any sensible obstruction in the path of the air stream, and even here the standard is given a sharp forward and after edge and stream line form in order to minimize any possible reaction on the propeller itself.

The propeller is carried on the forward end of a shaft 1¼ inches in diameter, which runs in ring oiling, cylindrical, bronze bearings. This shaft is driven without longitudinal constraint through a yoke at the rear end having hardened steel flat longitudinal surfaces which engage with small ball-bearing steel rollers on a companion yoke carried by a bevel gear. This bevel gear runs on ball bearings outside the hub, which is bored to provide freedom from contact with the propeller shaft. The driving motor, a 7.5-horsepower direct-current motor, is

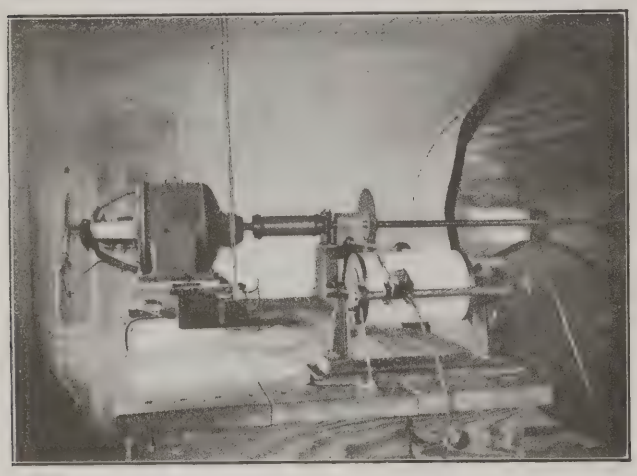


Fig. 7

placed well over at the side, entirely out of the wind stream, and drives the propeller shaft through bevel gearing and the yokes mentioned. In this manner the propeller shaft is subject to angular compulsion only so far as the motor drive is concerned. It is entirely free to move

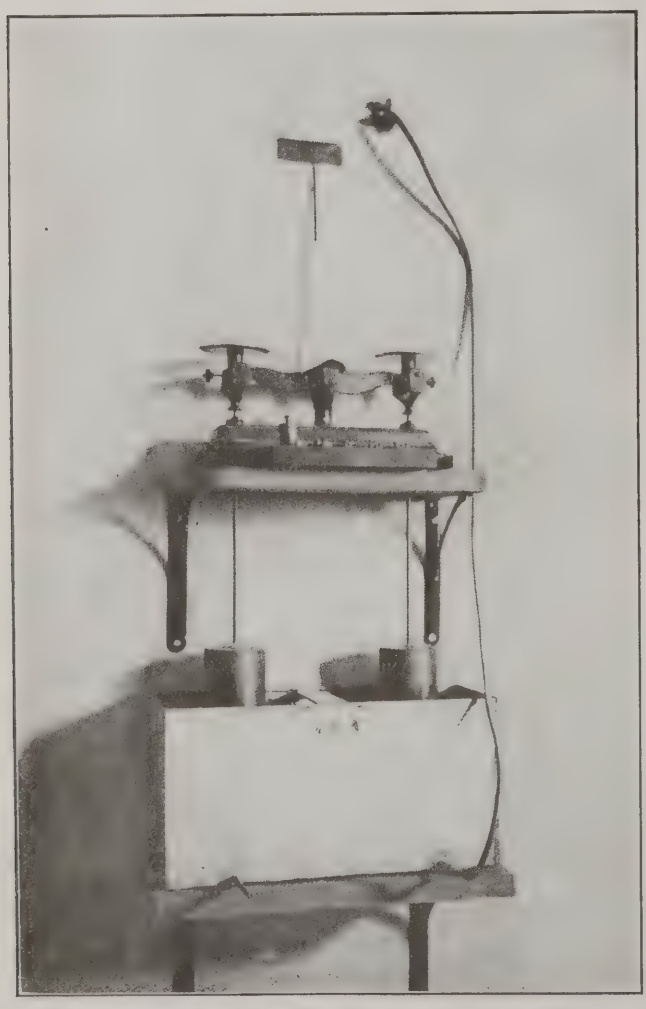


Fig. 8

longitudinally as may be determined by the other forces in play. These other forces are the pull (or thrust) due to the propeller itself and some form of weighing or measuring device calculated to control and balance such pull (or thrust). To this end the propeller shaft is furnished with two ball-bearing thrusts which connect through hardened-steel knife-edges with a vertical lever as shown in Plate IV. This lever is attached to a shaft which extends outside the standard, well beyond the wind stream where it carries a horizontal scale beam with suitable weights. An adjusting weight in the casing serves to adjust the center of gravity of the device for sensitiveness of movement, and suitable stops control the range of travel of the vertical arm, and hence the horizontal travel of the propeller shaft.

This arrangement furnishes a sensitive and reliable means of measuring longitudinal forces developed by the propeller and without constraint due to the motor drive. The frictional forces involved when the shaft is in rotation are so small as to be quite negligible in comparison with the propeller forces involved, but even these, small as they are, may readily be eliminated by suitable calibration.

(2) *Torque Dynamometer.*

The general arrangement of the torque dynamometer is shown in Plate V. The motor shaft is extended to the casing of the thrust dynamometer stand and is cut for the insertion of a special coiled spring. The torque on the motor shaft is then measured by the torsion of this spring. To measure this torsion two fiber disks are fitted to the shaft, one on either side of the spring, actually at A and B, as shown. These disks carry a narrow metal strip on the edge to serve as an electric contact. The contacts are electrically connected to the shaft and hence to each other. A fixed brush resting on the face of the disk A is carried by the dynamometer frame. From this brush is led an electric conductor, first to a battery, then to a telephone receiver, and then to a second brush mounted over the disk B, as shown in figure 6. It is clear that if the contacts on the disks pass under the brushes simultaneously the circuits will be closed for the instant and a click will be heard in the telephone receiver. If they do not pass simultaneously, the circuit will not be closed and no click will be heard. Suppose, then, with no torque on the shaft, the brush carrier at B is so adusted as to give simultaneous contacts and a click in the receiver is heard; then with a load thrown on and a resultant torque the spring will twist, the contacts will no longer be simultaneous, and no click will be heard. Then the brush holder at B can be moved around to a point where the contacts will again be simultaneous and the click will be picked up again. Obviously the angle through which the movable brush holder is carried in order to thus compensate for the twist in the drive spring will measure the angle of spring torsion, and thus by suitable calibration, as described later, is readily translated into torque moment.

(3) *Revolution Counter.*

The revolutions are counted by the movement on a drum, geared down by double worm-gear drive and so adusted in diameter that 1 inch of travel on the face of a paper strip carried on the drum is just 50 revolutions. The drum is appropriately mounted on a frame with pencil carrier and with electric connection to a seconds-beating pendulum. In operation the drum revolves and the pencil resting on the paper draws a line with jogs introduced by the click at second intervals. A given length of time is thus translated into revolutions and the revolutions per minute thence readily determined. A general view of this apparatus is shown in figure 7.

(4) *Air-Speed Meter.*

The ultimate measure of air speed was based on the Pitot tube. The type employed is that made by the American Blower Co. and known as the A. B. C. tube. In this type the static pressure is indicated through air holes of about 0.02-inch diameter. Exhaustive test for this pattern of tube has indicated that its coefficient may be taken as sensibly unity, and for all experimental work, as described later, such coefficient has been assumed. It is, however, not convenient to make, in connection with each observation, a series of Pitot tube readings on air velocity, and to avoid this a series of careful determinations were made between the depression (difference in pressure outside and within the experiment room), considered as an air-pressure head, and the resulting velocity at the propeller location within the experimnt room. This relation measures in effect the efficiency of the collector and honeycomb baffle, viewed as an orifice. The relation thus developed was as follows:

$$\text{Velocity head} = 0.876\ (P_1 - P_2)$$

where P_1 and P_2 denote the pressure heads without and within the experiment room.

The lost energy indicated by the difference between this and 100 per cent is distributed presumably among the following items:

(1) Friction resistance of collector surface.
(2) Resistance due to honeycomb baffle.
(3) General turbulence.
(4) Some slight spreading of the stream at the propeller location, with lower velocity as compared with that just at the delivery end of the collector.

With this relation between air velocity and experiment chamber depression assumed, a sensitive pressure indicator showing the pressure head between the experiment chamber and the surrounding room serves as an instantaneous air speed indicator.

Such pressure indicator is secured by the device shown in figure 8 and weighing to one-hundredth of a pound per square foot. The device as shown consists of two manometriccells carried each on opposite ends of a sensitive balance. The lower ends of the cells dip under coal oil, the space above the liquid being connected in one case to the air in the experiment chamber and in the other to the air in the surrounding room. The zero position of the scale is determined with both cups connected to the outer room. With one connected to the experiment room, the balance becomes disturbed, and the weights added to restore equilibrium furnish a direct measure of the depression within the experiment room. These indications calibrated against the Pitot tube measures of speed give then the direct relation desired between the measure of the depression and the air speed at the propeller position. The weights for the balance were of such mass as to give readings of pressure directly in pounds per square foot. These readings are independent of the fluid used. Coal oil was selected, as it kept the cans wet and there was no variation in the meniscus.

(*To be continued*)

"La théorie en Aviation doit être enseignée non par des ingénieurs de laboratoire, mais par ceux qui ont conçu et realisé les meilleurs appareils, car, en Aviation, la théorie même tient encore de l'empirisme: elle est de l'empirisme scientifique" ROLAND GARROS.

AEROPLANE CONSTRUCTION IN GENERAL

By OTTORINO POMILIO

(*Continued from page* 947)

Right and Left Controls—Taking a Turn (Virage)

FOR an aeroplane to have the characteristic of being able to keep in the same line of flight, it must be what is termed "correctly empennaged," *i. e.*, it must have the tendency to point always in a direction opposite to that of the wind.

Let us take, for example, a small flag or pennant. It will be "correctly empennaged" if the axis of rotation is found in front of the limiting position of the center of lateral pressures. In the aeroplane, the axis of rotation to be considered in relation to the direction of flight is the vertical axis through the center of gravity, which we have defined as the axis of direction of flight or the axis about which right or left direction movements take place.

When the wind is not parallel to the plane of symmetry, all the various parts of the aeroplane (chassis, fuselage, wings, auxiliary surfaces, interplane struts, etc.), are subjected to lateral components of the wind pressure. In order to simplify the line of reasoning we will substitute all of the foregoing parts by a vertical plane which will produce all the effects of those parts and which we will refer to as the "equivalent

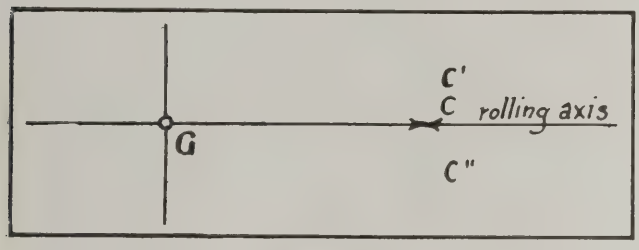


Figure 9

keel." An aeroplane will possess good qualities of direction of flight when the limiting position of the center of lateral pressures on the "equivalent keel" falls behind the axis of direction of flight.

In the average machine the center of gravity and therefore the vertical axis are found so far forward that the above condition is easily satisfied. There is, however, one type of aeroplane, the "canard" in which this condition is very difficult to attain. We will discuss the "canards" later in the chapter on "centrage."

Let us consider the position of the centers of lateral pressure relative to the rolling or longitudinal axis. Three cases are probable (Fig. 9):

1. The centers of pressure fall on the rolling axis.
2. The centers of pressure fall above the rolling axis.
3. The centers of pressure fall below the rolling axis.

In case 1, the lateral stability is not affected. In cases 2 and 3, any variation in the direction of flight affects the lateral stability because a couple is developed tending to tip the machine either to one side or the other. We will see now which of cases 2 and 3 will aid in taking a turn (virage).

Keeping in mind that a moving body will not travel in a curved path unless subjected to a centripetal force which is equal and opposite to the centrifugal force, then, in order for the aeroplane to take a curvilinear path, we must supply a centripetal force. This may be done in two ways:

a—by tipping the machine;

b—by giving the machine an "angle of drift" with the line of flight, so that a transverse component of the air reaction is brought to bear on the "equivalent keel."

When the aeroplane is tipped to one side by an angle Θ, the resultant R of the air reactions on the wing is inclined to the vertical by the same angle (Fig. 10). Therefore, an horizontal component C is developed which will cause the machine to deviate from its line of flight. If V is the velocity and P the weight of the aeroplane, the machine will describe a circle of radius so that

$$C = \frac{P}{g}\frac{V^2}{e}$$

but $C = R \sin \Theta$

therefore $$e = \frac{P}{g}\frac{V^2}{R \sin \Theta}$$

on the other hand $P = R \cos \Theta$

therefore $$e = \frac{l}{g}\frac{V^2}{\tan g\ \Theta}$$

When the radius of the turn satisfies the last of the above equations, it is said that a perfect turn (virage) has been made, and the tangent to the path of the aeroplane is in the plane of symmetry. The ailerons or the gauchissement are sufficient to effect a perfect turn or "virage."

The majority of machines, however, are provided with a vertical rudder. This will allow the aeroplane to take an "angle of drift," which is the angle between the line of flight and the plane of symmetry of the machine. The vertical rudder consists essentially of one or more vertical surfaces disposed at a certain distance behind the center of gravity. Diagrammatically, then, we can represent the axis of direction of flight, the equivalent keel, and the vertical rudder all on the plane of symmetry of the aeroplane (Fig. 11). When the vertical rudder is in the plane of symmetry, its action is to increase the effectiveness of the equivalent keel. If the rudder is made to deviate to the right or left, the reactions f' or f'' are brought to act, thus developing the couples $h'\ f'$ or $h''\ f''$.

Fig. 12 illustrates clearly what happens. In order to have equilibrium the new system must be so balanced as to satisfy the well-known equations of equilibrium. First, the condition must be satisfied that the resultant moment of all the forces contained in the horizontal plane must be equal to zero with respect to the center of gravity G. Therefore, equilibrium will not obtain without the machine "drifting" or making an angle with the line of flight.

This movement brings a reaction C_1 to act on the "equivalent keel," so that

$$C_1 \times K = f \times h$$

Due to this, and since $K < h$, a force d, equal to the resultant of C_1 & f is applied at the center of gravity G. The force d is the centripetal force causing the machine to effect a turn or "virage." In fact, under the action of d the aeroplane will describe a circular path of radius e so that

$$d = \frac{P}{g}\frac{V^2}{e}$$

(*Continued on page* 1082)

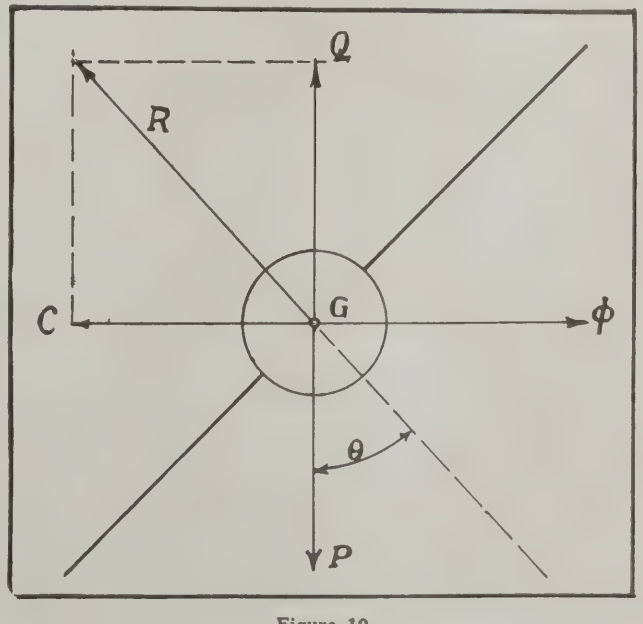


Figure 10

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications.

Specifications for Heat-Treated Alloy Steel Forgings and Stampings

(120,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicabilty, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S4.

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	120,000	84.3
Minimum yield point	95,000	66.8
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongation: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness valus of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test, unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible, shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the originl surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Alloy Steel Forgings and Stampings

(130,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S5.

MANUFACTURE.—3. *Heat treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheated treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, nothwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	130,000	91.5
Minimum yield point	115,000	80.9
Minimum elongation in 2 inches or proportional gauge length	17 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) This test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Annealed Carbon Steel Forgings and Stampings

(65,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S2; the steel has the following comparison:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1035	0.30–0.40	0.50–0.80	0.045	0.050

MANUFACTURE.—3. *Heat Treatment.*—(*a*) All orgifngs or stampings shall be annealed.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reannealed.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in ualityq, free from pipes, laps, cracks, twists, seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer

at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	65,000	45.7
Minimum yield point	36,000	25.3
Minimum elongation in 2 inches or proportional gauge length	25 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings Without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings From Which a Tensile Test Specimen Can Not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. (*a*) *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

(*b*) *Forgings or Stampings Weighing Less Than 6 Pounds (3.7 kg.), and of Suitable Section for Securing a Tensile Test Specimen.*—Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat-treated and with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Carbon Steel Forgings and Stampings

(80,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S2; the steel has the following composition:

MANUFACTURE.—3. *Heat Treatment.* (*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	80,000	56.2
Minimum yield point	60,000	42.2
Minimum elongation in 2 inches or proportional gauge length	22 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available tests shall be carried out if required to determine the specific impact work of ruupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings Without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from Which a Tensile Test Specimen Can Not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. (*a*) *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test, unless a tensile test is specified for each forging or stamping.

(*b*) *Forgings or Stampings Weighing Less Than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.*—Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Carbon Steel Forgings and Stampings

(95,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicabilit, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specifications 3S35; the steel shall have the following composition:

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.
1045	0.40–0.50	0.50–0.80	0.045	0.050

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	95,000	65.8
Minimum yield point	70,000	49.2
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	45 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinel Hardness Test.—(*d*) This test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A

(*Continued on page* 1080)

FOREIGN NEWS

AUSTRALIA

Lieut. W. J. Stutt, of Sydney, N. S. W., Australia, flew in a Curtiss biplane from Richmond, near Sydney, to Point Cook, near Melbourne, Victoria, covering the journey of 600 miles in 9 hours 32 minutes, his best non-stop being 263 miles in 3 hours 37 minutes. On his return journey he improved this record, making the distance in 7 hours and 20 minutes. Lieut. Stutt is the first aviator to fly between Melbourne and Sydney in one day.

AUSTRIA

Austria abandoned air raids over Italian towns out of deference to a protest from the Vatican, but resumed them upon the insistence of Germany, according to a semi-official dispatch from Rome. It said:

"A large German aeroplane was brought down by our anti-aircraft guns near Castelfranco and the three surviving officers declared that by order of the Austrian supreme command air raids over Italian towns had been suspended in consequence of the note of protest sent by the Pope, but the German supreme command had prevailed upon the Austrians to revoke their order and the devastation was resumed by their aviators.

"This fact proves that German militarism holds of no account the protests of the Pope, and that the Austrian command is absolutely helpless."

BELGIUM

Reni Vertongen, the most famous aviator in the Belgian army, has been missing for five days and is believed to have been drowned in the North Sea.

Cable despatches received by the Belgian Legation here said that Vertongen, who has been flying continuously since the beginning of the war, was last seen disappearing in a cloud bank over the sea.

BRAZIL

The Brazilian Foreign Minister, Nilo Pecanha, and the British Minister, Arthur Peel, made public a statement commenting on the notes which they exchanged regarding Brazil's part in the war. It is announced that the firm determination of Brazil is to take as active a part of the war as possible, to consist on the one hand by means of aviators sent to England and, on the other, by cruiser and destroyer squadrons.

CUBA

Press reports state that the Cuban wood, known as "majagua," which grows in the mountains of Pinar del Rio, is being tested with a view of utilizing it in aeroplane construction.

FRANCE

Summarizing aerial activity for the first ten days of February, the French official announcement of February 13th says:

"In the period from February 1st to 10th our pilots brought down twenty-eight German aeroplanes, fourteen of which were entirely destroyed and the other fourteen seriously damaged."

Flight-Sergt. Pilot Mox, son of the Governor of the Invalides, who has been a prisoner of war in Germany for two years, has succeeded in escaping after five futile attempts.

The French aviators, Captain Deullin, Lieutenant Madon and Lieutenant Fonck, are still engaged, says the "Petit Parisien," in their battle for the third place on the list of aces, now topped by Lieutenant Nungesser. Captain Heurteaux is second ace, but as his number of German machines downed is 21 and both Fonck and Madon having 20 to their credit, Deullin having 19, there is likely soon to be a four-cornered instead of a three-cornered contest.

GERMANY

Official statement issued February 12th says:

"The enemy made thirty-one air attacks on German territory during January. Fifteen of this number were made on the Lorraine and Luxembourg industrial districts. The towns raided included Ludwigshaven, Freiburg, Trier (Treves), Friedrichshaven, Rastatt, Offenburg, Mannheim and Karlsruhe.

"Although the number of attacks compared with those of the previous month was considerably increased, owing to the favorable weather, the damage and losses fortunately were smaller. Five persons were killed and nine wounded. The material damage was insignificant. There was no interruption of work worth mentioning.

"The enemy lost four aeroplanes during these attacks."

On February 13th the Germans announced reprisal raids on Nancy in retaliation of the successful allied raid against Saarbrücken, in the course of which an American aviator on his first flight downed a German machine. Operations on the Balkan front are also described. The announcement follows:

"In reprisal for an enemy raid on Saarbrücken our aviators yesterday evening dropped bombs on the fortress of Nancy with good effect.

"In Macedonia there has been artillery and aviation activity near Monastir and on the Vardar."

A news report from Paris states that three civilians were killed and five wounded as a result of the bombs dropped by the two German raiders.

According to the "Times" correspondent at Amsterdam, the Germans have withdrawn a well-known aerodrome 10 kilometres back of the lines, owing to British progress near Passchendaele, by which the camp became too much exposed to artillery fire.

GREAT BRITAIN

A special report on aerial activity was issued on February 10th by the British War Office, which outlines very extensive bombing activity, as follows:

"A successful bombing raid into Germany was carried out Saturday night. Nearly ten tons of bombs were dropped on an important railway junction and on sidings at Courcelles-lez-Metz, southeast of Metz. One of our bombing machines is missing."

Although before the outbreak of the war the output of British magnetos was not more than 100 a week, since the war no fewer than 165,000 magnetos are said to have been produced on the islands.

Among the recipients of the Order of the Britsh Empire is Mrs. Amy Pomeroy, for "executing a task requirng exceptional courage and self-sacrifice." This task was assisting her husband to invent the bullet which, it is asserted, largely ended the Zeppelin menace.

ITALY

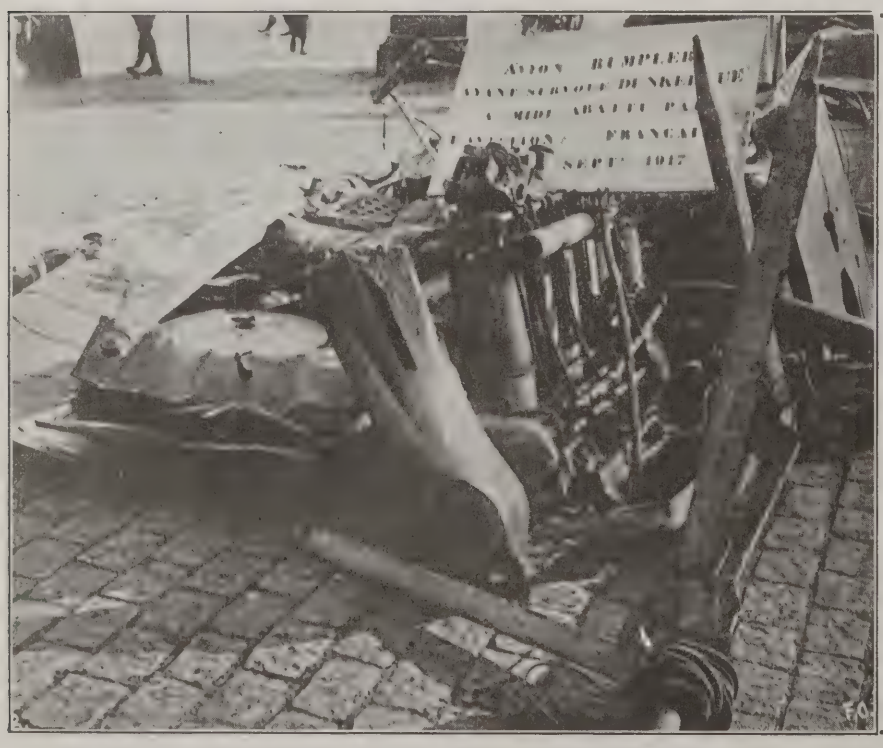
Italian seaplanes made successful attacks, according to the official announcement of February 10th, which outlines the operations as follows:

"A strong naval seaplane squadron bombarded with very good results the enemy's shelters at Revedoli, at the mouth of the Piave."

On February 11th the Italian War Office announced that an Italian airman downed two enemy 'planes.

Another enemy 'plane was destroyed by an Italian airman, according to the announcement of February 12th.

"East of Conegliano two enemy captive baloons were set on fire by British aviators," say the Italian official announcement of February 13th.

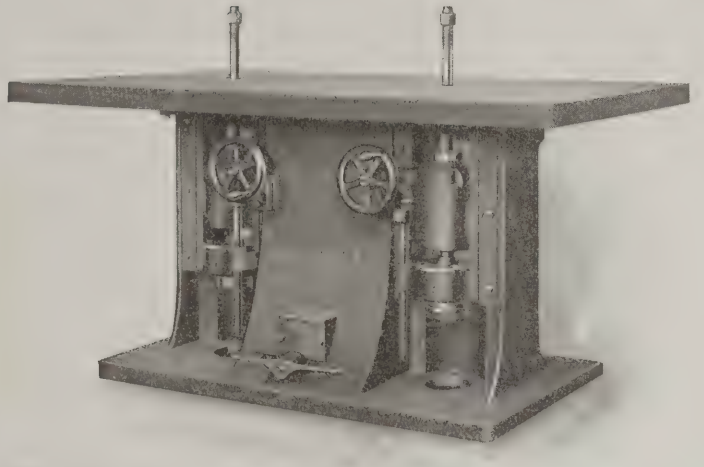


The fate of a German raider which attempted to drop bombs on Dunkirk.

French Official Photo



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NEW AVIATOR STYLES

For greater side vision than is possible with the **regulation styles,** we have designed this new aviator frame.



N. A. S. Has Silk Stockinette Collapsible Frame

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These styles have many points improved over **regulation** styles besides the great range of vision.

¶ In addition to the Army standard frame RESISTAL is now made in a variety of frames for aviator goggles and masks. Naval and military pilots insist upon RESISTAL Goggles.

¶ The Navy Department also has adopted RESISTAL for aviator goggles and masks.

The fit is perfect. The entire goggle weighs less and the wind pressure does not interfere with the comfort of the goggle. The lenses are set in aluminum frames, hinged to fold inward, and to afford clearer vision, directly ahead as well as the sides.

Can be ground to any oculist's prescription.
Also made in NO-GLARE, RESISTAL lenses.

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STRAUSS & BUEGELEISEN

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(*Continued from page* 1075)

hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible, shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings and stampings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of the original surface.

PACKING, SHIPPING AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.

Specifications for Heat-Treated Alloy Steel Forgings and Stampings

(100,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S3.

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists and seams, and must have a workmanlike finish.

(*b*) A forging or stamping may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings or stampings shall be returned to the manufacturer at his expense. This clause shall not apply to materials fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. (*a*) The heat-treated forgings or stampings shall have the following physical properties:

Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	100,000	70.3
Minimum yield point	80,000	56.2
Minimum elongation in 2 inches or proportional gauge length	20 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

Brinell Hardness Test.—(*d*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows:

(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongations: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test, unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*Continued on page* 1083)

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(*Continued from page* 1073)

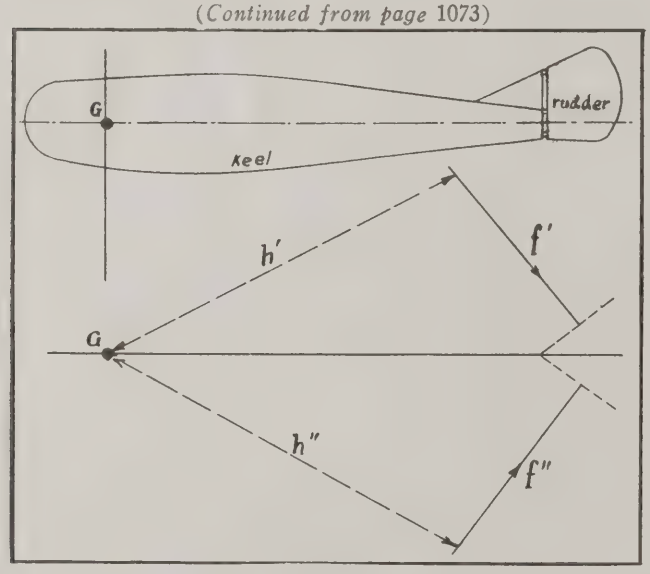


Figure 11

The resultant d will increase in magnitude as C_1 becomes larger and f decreases. Therefore, it is clear that in order to be able to make turns of short radii it would be convenient to have the value of K as small as possible. To keep the machine in a constant direction the opposite is true. This explains why "vertical keels" of large area and at a distance from the center of gravity make it impossible to take sharp turns.

Therefore certain relations must be observed between the areas of the "equivalent keel" and the vertical rudder and their distance from the center of gravity.

For example, there are machines in which the vertical rudder area is too small with respect to the vertical surfaces constituting the equivalent keel. This makes side slipping dangerous because the vertical rudder is unable to make the machine turn sharply and thus recover from the side-slip.

From that point of view the cloth covering on the rear part of the machine may have great influence.

In actual practice turns are effected by tipping the machine and by action of the vertical rudder both at the same time. Here we will examine again the influence that the position of the centers of pressure C_1 on the equivalent keel has with respect to the rolling axis. It will be noted at once that in order to make a safe turn, the machine must "drift" externally of the turn. Under this condition if C_1 acts above the rolling axis the aeroplane will tend to tip internally of the turn, thus facilitating the manoeuver. On the other hand, if C_1 falls below the rolling axis, the machine has the tendency to tip toward the outside of the turn. In the latter case the ailerons or the "gauchissement" must be resorted to.

Before ending this discussion we will bring to the attention of the reader the fact that the vertical rudder action influences the lateral stability to the same degree that the action of the lateral controls affects the direction of flight. In fact, in taking a turn the outside wing has a velocity greater than that of the inside wing, thus increasing the lift on the outside wing.

One last point will be brought out concerning "virage" and that is in regard with two phenomena which develop while a turn is being effected: One is the increase in head resistance due to the "drifting"; the other is the decrease in the vertical lifting component caused by the lateral tipping of the aeroplane. Both of these phenomena produce a decrease in

(*Continued on page* 1085)

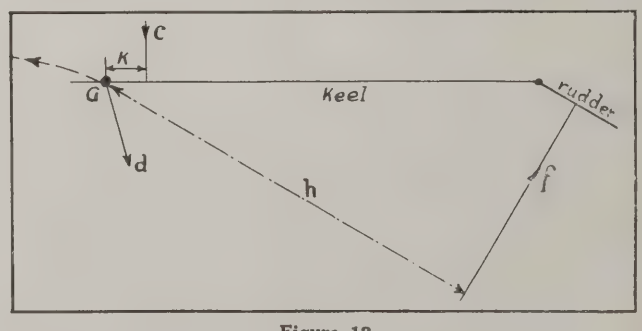


Figure 12



(*Continued from page* 1080)

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least 1 tensile test shall be made for each lot of 50 forgings or stampings.

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Specifications for Heat-Treated Alloy Steel Forgings and Stampings
(120,000 Pounds per Square Inch Tensile Strength)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings or stampings are made shall conform to I. A. S. B. specification 3S4.

MANUFACTURE.—3. *Heat Treatment.*—(*a*) Forgings or stampings should be annealed before heat treatment.

(*b*) Forgings or stampings which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings and stampings must be uniform in quality, free from pipes, laps, cracks, twists and seams, and must have a workmanlike finish.

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Tensile Test.—(*b*)

	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	120,000	84.3
Minimum yield point	95,000	66.8
Minimum elongation in 2 inches or proportional gauge length	18 per cent.	
Minimum reduction of area	50 per cent.	

Impact Test.—(*c*) When impact-testing machines of the pendulum type are available, tests shall be carried out if required to determine the specific impact work of rupture in foot-pounds (or kilogram-meters). Results markedly lower than the average for this type of material will be sufficient cause for further investigation (or reheat treatment) of the material.

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(1) Forgings with a Prolongation for Tensile Test Specimens: A hardness test shall be made on the prolong and on the opposite end of the forging. The hardness values obtained must agree within 3 per cent. Hardness values of other forgings in the same lot must agree with the average of the two test values within 3 per cent.

(2) Forgings or Stampings without Prolongation: Hardness tests shall be made on the forgings or stampings selected for the tensile test and must agree within 3 per cent. The hardness values of other forgings or stampings in the same lot must agree with the average of the values so obtained within 3 per cent.

(3) Forgings or Stampings from which a Tensile Test Specimen can not be Procured: A hardness test shall be made on the forged bar representing the forgings or stampings. The hardness values of the forgings or stampings in the lot must agree with that obtained on the bar within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. *Forgings or Stampings Weighing 6 Pounds (3.7 kg.) or Over.*—(*a*) If desired, each piece may be required to have a prolongation for the tensile test. Two per cent of the forgings or stampings in each lot shall be subjected to the tensile test, unless a tensile test is specified for each forging or stamping.

Forgings or Stampings Weighing Less than 6 Pounds (3.7 kg.) and of Suitable Section for Securing a Tensile Test Specimen.—(*b*) Two per cent of the forgings or stampings shall be taken for the tensile test.

(*c*) Forgings or stampings from which no tensile test specimen can be secured shall be represented by a bar forged from the same material and to the ruling section of the forgings or stampings in the lot. The bar must be heat treated with the lot which it represents.

(*d*) At least one tensile test shall be made for each lot of 50 forgings or stampings.

(*e*) A hardness test may be required on each forging or stamping offered. At least 25 per cent of the prices in each lot shall be tested for hardness.

(*f*) All the forgings or stampings in a lot shall be heat treated at the same time, and if possible, shall be from the same heat of steel.

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PACKING, SHIPPING, AND DELIVERY.—8. Small forgings or stampings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.). Each kind and lot of forgings or stampings shall be kept separate as inspected.



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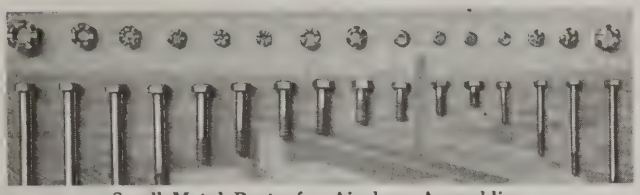
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Ball, Roller, Thrust, Combination Bearings

the lifting effort, so that an increase in velocity is necessitated. If the engine will not allow this, then the velocity required must be obtained by descending and turning at the same time.

Control Levers.

The Wright type of aeroplane had two levers: one for the combined control of the vertical rudder and the "gauchissement," the other for the elevator.

Today, however, the so-called "instinctive" system of controls is in general use. In almost all machines we find

1. A foot-bar for the vertical rudder.
2. One single lever for the ailerons and the elevator.

Fig. 13 illustrates clearly the operation of the levers.

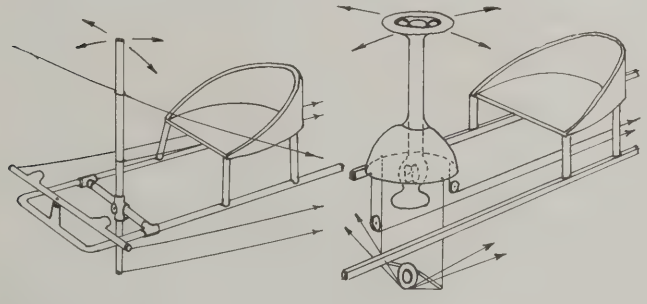


Figure 13

In the Breguet machine the combination lever (2) controls the vertical rudder by means of a steering wheel attached to its upper end.

The combination lever in the Nieuport type controls both the elevator and the vertical rudder, the "gauchissement" being controlled by the foot-bar. This is done on account of the rigidity of the Nieuport wing. The "gauchissement" of that type of wing requires considerable physical effort which can be better exerted with the feet. Here we might say that the "gauchissement" is made easier if the longerons are of circular steel tubing.

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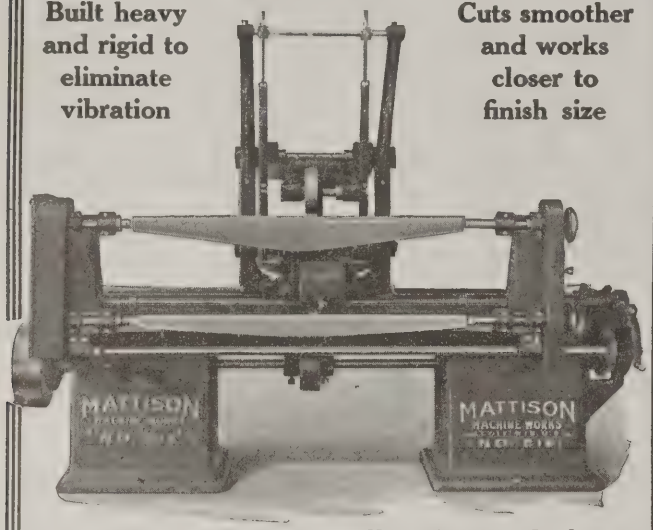
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Mattison No. 216 Heavy Type Copying Lathe

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It is designed especially to meet the exacting needs of strut work, and is a great improvement over the ordinary Copying Lathe, both as to quality and quantity of output.

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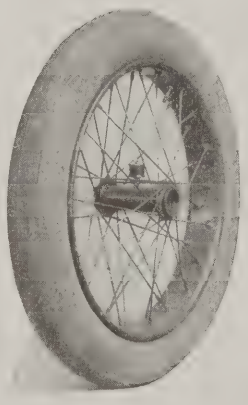
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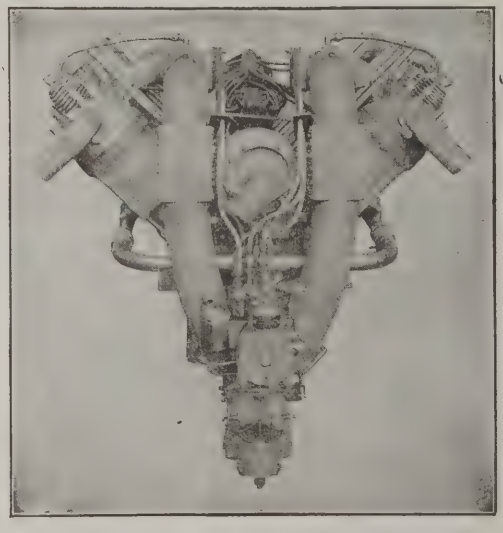
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AERIAL AGE WEEKLY

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Vol. 6, No. 25 MARCH 4, 1918 10 CENTS A COPY



Another one of the 140 remarkable paintings of Lieutenant Farré, the official painter of the French Army and Navy, to be exhibited at the Anderson Galleries, 59th Street and Park Avenue, New York City, March 9 to 20.

There will also be shown the battleplane with which the famous Captain Guynemer brought down five German aviators and films of the latest aerial flights.

NOTICE TO READERS

When you finish reading this issue place a one-cent stamp on this notice, hand same to any postal employee, and it will be placed in the hands of our soldiers or sailors at the front.

NO WRAPPING—NO ADDRESS

A. S. Burleson, Postmaster-General

Adoption Of Plan To Protect Aviators' Life By War Department Made Possible By Patriotic Citizens

The U.S. Government Specifies—

g Agent,
Office Department.

In accordance with the above advertisement, inviting proposals for supplies, and subject to all the conditions thereof, the undersigned propose to furnish and deliver the articles below specified, F. O. B., factory, at the prices set opposite each article, and within the time specified.
Price for each item must be specified as well as total amount of bid.

Quantity:	Article.	Price
5	. Aeroplanes, complete, capable of carrying 300 lbs. of mail a distance of not less than 200 miles, non-stop, at a maximum speed full load of 100 miles, minimum speed full load 45 miles, climbing speed 6,000 feet in ten minutes, and equipped with Hispano-Suiza Motor, 150 H.	
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VOL. VI. NEW YORK, MARCH 4, 1918 No. 25

ADOPTION OF PLAN TO PROTECT AVIATORS' LIFE BY WAR DEPARTMENT MADE POSSIBLE BY PATRIOTIC CITIZENS

HAVING been advised that the Air Division, Signal Corps, is anxious to adopt Walter Camp's plan to protect the aviators' lives, but was prevented by lack of funds, patriotic citizens, including Mrs. E. H. Harriman, Mrs. William Crocker, Mrs. Charles A. Van Rensselaer, Mrs. French Vanderbilt, Miss Alice Carpenter, Mrs. Horatio Slater, Mrs. Henry A. Wise Wood, Mrs. Marshall Russell, Mrs. William Allen Bartlett, Messrs. Alan R. Hawley, V. Everit Macy, Cortlandt F. Bishop, Henry Woodhouse and Irene Dupont, have started a fund to enable the Air Division of the Signal Corps to adopt the plan.

The Air Division of the Signal Corps is particularly anxious to get these trainers immediately, believing that it will decrease the mortality at the aviation training camps, which is getting to be quite high. Unfortunately, it will take an Act of Congress to get even the small sum needed to pay the salaries of these trainers, and that will take time.

Therefore the Air Personnel Division recommended that Captain Wren be authorized to arrange immediately with Mr. Walter Camp to engage at least ten, and not more than fifteen, competent athletic trainers and accept the offer to have the salaries of these trainers paid by patriotic people.

The official memorandum authorizing Captain Wren to take this action points out that it will only cost $22,500 to pay for the salaries of the trainers for six months, and that if thereby they succeed in saving only one cadet and one machine their services will practically have been paid for, because the loss of a cadet and of a machine amounts to $23,000, as follows:

Insurance of cadet	$10,000
Estimated cost of training cadet	5,000
Cost of machine	8,000

Mr. Walter Camp took the matter up with the Aero Club of America, which promptly subscribed $1,000, to which a member of the Club, Mr. V. Everit Macy, added $500 to pay for one trainer. The Club then presented the matter to the officials of the Woman's Naval Service and Mrs. E. H. Harriman and Mrs. William Crocker, who each subscribed $1,500 to pay for two trainers. The Aviation Section of the National Special Aid Society also made a contribution, and other prominent people have contributed sums. Mrs. Charles A. Van Rensselaer, Chairman of the Aeronautic Committee of the Woman's Naval Service, hopes that the entire sum will be raised among the members of the Woman's Naval Service in a few days.

The official memorandum of the Air Personnel Division of the Signal Corps, authorizing the adoption of the training, states in part:

"These trainers, upon employment, should be sent as soon as possible to the various fields where flying instruction is now being given.

"It is suggested that their duties be those outlined in paragraph 3 of letter January 3, from Mr. Camp, viz.:

> "'(a) To keep all cadets in the best physical condition by regulating and selecting their diet, watching their hours of sleep and giving them calisthenics, etc.
>
> "'(b) To report to the Commandant of Cadets any cadet who is not in fit condition to fly.
>
> "'(c) To live in cadet barracks and to endeavor to become well acquainted with all cadets, so as to be able to learn their nervous as well as their physical condition and to be able to make a report at any time to the Commanding Officer of the exact condition of each cadet.'

"As far as the expense of hiring these trainers is concerned, it is pointed out that if the maximum of fifteen trainers are engaged for the full period of six months at $250 per month the total expense would amount to $22,500. If they but succeed in saving one cadet and one machine their services will practically have been paid for; viz., insurance of cadet, $10,000; estimated training of cadet, $5,000; and cost of machine, $8,000—total $23,000."

"CONTROL OF THE AIR IN THE AMERICAN SECTOR BELONGS TO THE ENEMY," STATES ASSOCIATED PRESS DISPATCH

THE newspapers of the country published the following dispatch from the Associated Press on February 20:

"Control of the air in the American sector belongs to the enemy. Any officer at the front will make this declaration—all have made it. The control is obvious. German aeroplanes come and go over the American lines almost at will.

"Every time the Germans come over their path through the sky is followed by fleecy shrapnel puffs, but the chances of hitting an aeroplane with anti-aircraft shells is so remote that the enemy aviators calmly fly along as if on a pleasure tour. Every now and then aeroplanes on this side attack the enemy. They always do this when they get a chance. But the Boche is clever while flying and manages to come over and take pictures, make observations, and do virtually whatever else he desires, and then calmly sail home without interruption. Nearly always he is at an altitude of about 3,000 metres, where he is comparatively safe from anti-aircraft fire, and knows it.

"It is not permitted to name any officers of the American expeditionary force. It is not permitted to quote them. If both were allowed it would be possible to carry quotations from virtually every officer at the front urging a speedy appearance of large numbers of American aeroplanes with American pilots.

Only One Way to Secure Control

"For there is only one way to wrest control of the air from the enemy; that is to fight him for it in the sky and to relieve him of it by force of overwhelming numbers. Right now, if the Germans knew American aeroplanes were waiting for them every time they came over the line, their trips would be less frequent. Neither would they dare to attempt such a bold piece of work as when they recently flew over the line in an aeroplane disguised with the Allied red, white and blue bull's-eye marking, and cut loose with a machine gun on American soldiers in the trenches. If there had been American planes near by the chances of the Germans getting back home after such a trick would be small, and it is extremely doubtful, officers say, if they ever would have tried it.

"Any officer also will say that the safety of individual soldiers depends upon keeping the enemy from doing as he pleases overhead. For days the Germans have been flying over certain towns where American troops have been resting after periods in the trenches. Once or twice these daylight observation tours have been followed the same night by visits by enemy bombing planes.

"So free and unrestricted are the German airmen that in some towns the commands are under strict orders to disappear under cover the moment a German aeroplane is sighted. Moreover, officers say, more and more German planes are appearing in the sky, and in various quarters there is a growing belief that these are the first of the machines which the Germans have been building feverishly to offset the large number of expected American aeroplanes in accordance with plans announced in the United States.

"Whether this belief is true or not, the fact remains that American troops are holding the sector and are endangered daily because there are no American aeroplanes with them. The question most asked from one end of the American front to the other is: 'When are some American planes coming here?'"

Aero Club Telegraphs Baker

At a special meeting of the Executive Board of the Aero Club of America the following statement was issued by the Club:

"Appreciating that the Associated Press dispatch published today, which states that the Germans are masters of the air at the fronts, will make the country at large realize that unless the United States can supply the aeroplanes, equipment and aviators needed to cope with the situation, disaster will follow, the Executive Committee of the Aero Club of America today held a special meeting, at which it was resolved to send to Secretary Baker the following telegram, urging that he issue a public statement covering the following points:

"(1) Have the plans for aircraft production which were made at the time Italy was victorious and Russia was still fighting been extended sufficiently to supply the large number of aeroplanes and aviators needed to cope with the present situation?

"(2) The War Department two months ago made public the fact that the Army in its estimate for this year asked for pay for close to 12,000 officers and 85,000 enlisted men for the Aviation Section of the Signal Corps. As this has been published, the Germans will logically expect to meet at least 10,000 American aviators within a year, and will, no doubt, prepare for same.

"It takes an average of two aeroplanes with special motors to give the preliminary and advanced training to each of these 10,000 aviators. It also takes an average of six aeroplanes and spare parts and spare motors to keep each of these aviators on the front for one year. This makes a total of 80,000 aeroplanes and more than twice that number of motors needed to carry out the plan which the Germans have good reasons to expect that we will carry out.

"Have steps been taken to get from Congress appropriations needed and to place the orders for these aeroplanes and motors?

"In view of the fact that it has been published that the War Department asks for pay for 12,000 aviators, and that there is every reason to believe that the Germans will concentrate their efforts to meet that increase in the Allied fighting forces, it cannot give any comfort to the enemy to learn that the plan is actually being put into effect and it will be a great relief to the country to know that it is being put into effect."

Aircraft Now on Way to the French Battle Front is Announcement of the Secretary of War

The following statement is authorized by the Secretary of War in order to give as complete a picture as is permissible under military requirements of the problems and the progress in equipping the air service with fighting planes.

The first American-built battle planes are to-day en route to the front in France. This first shipment, though in itself not large, marks the final overcoming of many difficulties met in building up this new and intricate industry.

Equipped With Liberty Motor

These planes are equipped with the first Liberty motor from machine production. One of them in a recent test surpassed all records for speed and climbing for planes of that type. Engine production, which began a month ago, is now on a quantity basis and the peak of production will be reached in a few weeks. Only the 12-cylinder type is being made, as developments abroad have made it wise to concentrate on the high-powered engine instead of the eight-cylinder.

These statements should not be exaggerated, but should be considered in the light of the following facts: After three years of warfare the total number of planes able to take the air at any one time on either side of the western front has not been over 2,500. This, combined with the fact that 46 men are required on the ground for every plane in the air, gives a truer perspective of the European aviation situation than commonly possessed.

Replacement Planes

For every plane in the air, there must be two replacement planes on the ground, and one training plane for every pilot who eventually reaches the front, with a spare engine for each plane. Moreover, while the American program has been delayed by difficulties which were impossible to foresee when the tentative program was adopted in all our lack of knowledge last Spring, it may be said that American planes are not due in France under the original schedule until July.

At the outbreak of war the first step, both in sequence and importance, was to build up an industry to rush out the training planes needed for the prospective aviators who were immediately on hand. This fresh and most promising personnel afforded indeed America's largest immediate source of aid to her associate nations in the war, which, while well able to turn out the latest type of aeroplanes, were seriously drained of men capable of manning them. The ultimate goal, however, was the construction of a large fleet of battle planes.

Two serious problems, interwoven and reacting, were immediately met, the almost total lack both of aeroplane industry and of aeroplane engineering knowledge. The industry was rudimentary, with only one company on an appreciable production basis and another dozen small experimental companies. The metal work was mostly done by hand, each machine built as a separate unit and little attempt made to manufacture from dies, jigs or gauges. The estimates of the total value of the industry vary from $2,000,000 to $10,000,000 and of employees from 5,000 to 10,000. The Government was practically the only purchaser, having ordered 366 planes the year before the war, of which only 66 were actually delivered.

Difficulties in Europe

The engineering problems were even more complex. Europe, at war, with the best engineers of each country pitted against each other in a struggle which knew no close, had worked out the most ingenious developments in the light of actual fighting experience. Information reaching here was generally fragmentary and always late. As a result, when war came, the United States had practically no aeroplane engineering staff and no modern fighting planes.

Construction of planes presented a much more complex problem than that of engines, which had been developed and produced here for other purposes on a colossal scale. The extreme refinement of their manufacture, requiring 23,000 screws in a single fighter, or 700 pieces of wood in a single wing, necessitated the most expert workmanship and balance to secure the essential combination of lightness with strength, and seemed to militate against quantity production.

Securing Information

The first step was to secure information from Europe. A commission was early sent across and rushed back the last-minute details, upon the strength of which a large number of fighting planes of a certain type were ordered. The raw materials were very largely in hand and the drawings within several days of completion when another cable said that this type had been superseded and should not be built. Nearly a month was thus lost.

Drawings then came for another type. They had just been redrawn for American manufacture and the die makers put to work when a second and different set arrived. The work done had to be cast aside and the process begun over again. Just as it was nearing completion still a third set of drawings arrived, and a third start was necessary. The unavoidable loss of time was preferred to turning out a design known at the outset to be out of date.

The effect of separation from the battlefields by 3,000 miles is further shown in that anywhere from 17 days to 11 weeks have been required to secure various important samples from abroad. Another three weeks of day and night work is necessary to reduce these samples to drawings for American manufacture. It is significant of the rapid development of the art of aviation that not a single type of the original schedule has survived into the present program.

During the past month, however, a responsive channel of communication with the Allies has been opened, the latest types adapted to American manufacture, the industry increased at least twentyfold, the training-plane problem solved, and the production of battle planes begun. It is still very necessary, however, to view America's effort in aviation against the true perspective, both in this country and in Europe.

Need for Skilled Men

The great problem now remaining is to secure the thousands of skilled mechanics, enginemen, motor repair men, wood and metal workers, etc., needed to keep the planes always in perfect condition. This great engineering and mechanical force at the airdromes, the flying fields, and the repair depots, both here and behind the lines in France, is a vital industrial link in the chain to supremacy. Without them the planes turned out would soon be useless and the flyers helpless.

At best the life of a plane is but two months, and the engine must be overhauled after 75 hours, while a pilot on a plane allowed to leave the hangars in imperfect condition is as helpless as a bird with a broken wing. Now that American battle planes are going overseas, a great increase in the volunteering of skilled mechanics is both essential and expected.



The News of the Week



Lieutenant Sperry and His Fiancee Fly to Governors Island Church to be Married

Lieutenant Lawrence B. Sperry, aeronautical inventor and now a navy aviator, flew from Massapequa, L. I., where he is stationed, with Miss Winifred Allen, his fiancée, to Governors Island, and the two were married there a few minutes after they landed by the Rev. Dr. A. B. Smith, curate of St. Cornelius's Chapel, on the island.

The pair had been engaged for some time, but Lieutenant Sperry was so busy with his duties at Massapequa that he could get only a few hours' leave for his marriage. Miss Allen, however, had full confidence in her fiancé's skill as an aviator, so arrangements were made for the wedding, and about an hour before the time set for it the two climbed into an aeroplane at the naval aviation station at Massapequa and started on a flight to Governors Island, which was finished in record time.

Lieutenant Sperry is the son of Elmer A. Sperry, inventor of the aeroplane stabilizer. He has been associated with his father's inventions and manufactures, and has done much work in the perfection of the gyroscope himself. For some months past he has been in the Naval Aviation Service.

Few Aero Mail Bids

Notice of less than ten days is responsible for the few bids on the Aero Mail project from firms that are working on Government contracts; and the clause which states that "The contracts will be awarded to the bidders whose aeroplanes have stood satisfactory service test in the War and Navy Departments" eliminated new firms.

There were, therefore, only three bidders who bid as follows:

Standard Aero Corporation, delivery in 63 days, $68,000 for the planes and $5,500 for the parts; The United Eastern Aeroplane Corporation, delivery in 80 days, $——— for the aeroplanes and $4,317 for the parts; The West Virginia Aircraft Company, delivery in 90 days, $72,500 for the aeroplanes and $4,907 for the spare parts.

Hotel to Build Aero Hangars for Its Guests

Hotel Commodore, now under construction at Forty-second Street, near Grand Central Station, New York City, will construct a landing place for aeroplanes on its roof. The machines will be sheltered in hangars opening on the roof, and there will be dressing rooms for the aviators in the aero annex. Aeroplane experts have been consulted as to the structure, and the roof which will welcome the aviators will have an aera equal to that of sixteen city lots, 25 feet by 100 feet each. The building is to be twelve stories high.

Captain Bartlett Commended by Secretary Daniels

Captain Robert A. Bartlett, the famous Arctic Explorer, member of the Aero Club of America, has been commended by Secretary Daniels for good service.

The commendation reads as follows:

To Lieutenant-Commander Robert A. Bartlett,
U. S. N. R. F., Naval Auxiliary Reserve,
New York, N. Y.

Subject: Commendation.

"1. The Department takes pleasure in quoting below for your information an extract from a letter received from the Chief of Naval Operations, dated January 26, 1918, regarding the cruise of the *Favorite* from Quebec, Canada, to Boston, Mass., January 10-23, 1918, when the St. Lawrence River and Gulf of St. Lawrence were filled with ice and it was the general opinion of the local pilots that a vessel would not be able to make passage until Spring.

"The expeditious passage of the *Favorite* from Quebec to Boston is considered to be an extremely efficient performance."

"2. The Department hereby commends you for the excellent work performed by you in bringing the *Favorite* safely to Boston, on the above mentioned occasion.

"3. A copy of this letter will be filed with your official efficiency record.

(Signed) JOSEPHUS DANIELS."

A. E. Barlow Sales Manager for the Boyce Moto-Meter

A. E. Barlow, well known in the automobile trade on account of his past activities as sales manager, for both the Ever-Ready products, and the well known Rayfield carburetor, has been appointed sales manager for Boyce Moto-Meters.

Mr. Barlow will have full charge of the distribution of this item through the dealer and jobbing channels, and will make his permanent headquarters at the main office and factory of the Moto-Meter Company at Long Island City, N. Y.

It is the intention of the Moto-Meter Company to add a number of roadmen to its already rather extensive sales organization.

Glenn L. Martin Company Secures Fifty Acre Tract

Cleveland added another important industry to its already long list of diversified vocations when the Manufacturers Realty Co., 1006 Williamson Building, closed a ninety-nine year lease with the Glenn L. Martin Co. for fifty-five and one-half acres of land running from St. Clair avenue N. E. to the Nickel Plate Railroad just east of Wayside road N. E., yesterday afternoon.

The Glenn L. Martin Co. incorporated several months ago by prominent Cleveland business men, has leased this large parcel for the manufacture of airplanes. Owing to the fact that the company has a large Government contract for aircraft and speed is essential, the breaking of ground for the first unit of a building on St. Clair avenue started simultaneously with the signing of the lease.

This is said to be the largest lease for years. dustrial acreage made in Cleveland for years. It was handled by Daniel R. Taylor and Raymond T. Cragin of the Manufacturers Realty Co. and A. S. Taylor of V. C. Taylor & Son.

Mr. Martin refused to state the size of the order or the kind of machines that are to be made. He said that all efforts for the present would be put toward government needs and that he expected work would be started in sixty days. Thirty cars of steel consigned for this work are in readiness to be shipped here as soon as the location was decided upon, Mr. Martin said.

The first unit of the building will be 220 by 300 feet and will be erected eighty feet from St. Clair avenue. Contract for this structure has been awarded to the Crowell-Lundoff-Little Co., 1951 East 57th street, and is to be completed in forty-five days. It will cost about $200,000. Ultimately a second unit will be erected increasing the floor space to 216,000 square feet.

Sufficient land has been acquired to make flights possible and it may soon be no uncommon sight to see the sky in this vicinity darkened with aeroplanes on test trials much as our streets have been used for testing automobiles.

Associated with Mr. Martin in this company are several highly efficient aircraft engineers, men who have been with the famous flyer who is the general manager of this company, for several years. Among the men associated with Mr. Martin are Howard G. Benedict of New York, who will serve as works manager.

L. D. Bell, manager of the experimental production, has been with Mr. Martin in Los Angeles since 1911. D. W. Douglas, chief aeronautic engineer, was manager of the Los Angeles plant controlled by Mr. Martin until a year and a half ago when he was called to work for the Government. He has just been released to take up duties with this company. Erick Springer, skilled aviator who will test the machines here was one of Martin's pupils in California. H. W. Pittinger also from Los Angeles will serve as foreman of the experimental production department. Jack Rambach is superintendent of production.

C. A. Van Dusen of Los Angeles is master mechanic and W. A. Crenning, Los Angeles, will have charge of the purchasing, employment and welfare departments.

Officers of the Glenn L. Martin Co. are Charles E. Thompson, president; Glenn L. Martin, vice president; W. D. Turner, secretary; S. Livingstone Mather, treasurer. These men with William G. Mather, C. N. Bingham, Alva Bradley, M. B. Johnson and Charles W. Bingham form the board of directors.

Lieut. Male Heads Aeroplane Production at Philadelphia Naval Aircraft Factory

Lieut. Arthur J. Male, who has been commissioned a Lieutenant in the United States Navy is in charge of aeroplane production at the recently completed Naval aircraft factory at League Island Navy Yard, Philadelphia, Pa.

Lieut. Male was formerly in charge of the final assembling of the machines which the Curtiss Company made before the war, after which he and Capt. Baldwin ran the aviation school at Newport News, going from there to supervise the work at the Aeromarine Plane & Motor Company at Nutley, N. J.

Air Stunts Essential in Training Fliers, Declares Veteran

Hair-raising stunts by student aviators may seem foolhardy to the casual observer, but they are a vital part of the army fliers' training, says Lieutenant-Colonel Charles E. Lee, of the British Royal Flying Corps.

"To forbid student aviators to attempt these stunts may save a few fatalities at training camps on this side," said Colonel Lee, "but will certainly be the cause of hundreds of them at the front."

For the last three days Colonel Lee, head of the British aviation mission in the United States, has been doing war tricks in the air over the national capital in an Avro training biplane, built by the A. V. Roe Company, of England, to show officials and others what the American air fighter must prepare to do when he flies over the German lines.

Doing the Immelmann turn, the loop-the-loop, the falling leaf and other breath-taking feats has caused many to turn their faces and gasp. This demonstration of what a fighting man must do in the air, coming at a time when several student aviators have been killed at American camps, raised a question as to whether they were really necessary or were only stunts.

"Most emphatically," said Colonel Lee, "they are necessary when the airman goes into battle if he expects to out-manoeuvre his adversary,



A British machine in the hands of the enemy.

slip out of tight places and become an efficient fighting flier. Moreover," said Colonel Lee, "they are not dangerous, provided the pilot has been trained and knows his machine. The ability to perform them is indispensable," the colonel declared, "if the aviator is to be an effective fighting factor.

"If the pilot is to be given a fair chance of doing well on the western front it is well he should be taught acrobatics in the air," said Colonel Lee. "The so-called danger in flying lies not with those who do stunts in the air, but with those who cannot do them. All evolutions have to be shown the pupil by stages, and there should never be a position in which the aeroplane can be placed from which a pilot cannot with ease rectify, knowing exactly what he is doing. Unless a pilot can turn his machine any way and every way at any time in order to manoeuvre for position all the straight flying in the world will not help him when he has to fight.

"Formation flying is one of the most important things of modern day flying, but it must be borne in mind that as soon as a formation of approximately its own strength is met and general action ensues it is individuality and capability of the individual fliers which will win.

"It is not a question of showing off the aerial stunts, or of pretending to do anything which some one else cannot do. It is only meant to show that an aeroplane can be made to manoeuvre quickly in the air, with great ease and with safety. No pilot should be sent overseas who cannot do all these things and more. If he cannot do them he will be shot down sooner or later."

Liberty Motor Engineers Promoted

In the list of promotions issued by the War Department, it was learned that Capt. Howard C. Marmon has been promoted to the rank (temporary) of Major. Major Jesse C. Vincent has received the temporary grade of Lieutenant-Colonel.

With the American Airmen Abroad

Two American aviators, Harry F. W. Johnson, South Bethelhem, Pa., and Landrum Ovington, Paris, both serving with the Lafayette Squadrilla, engaged three German machines on January 19. Johnson received a bullet in the stomach and had to "spiral" down. Ovington's machine was shot full of holes, but he was unhurt.

Johnson, who is twenty-one years of age and a graduate of Lehigh University, has been operated upon and is doing well. Ovington is twenty years old.

Vice Admiral Sims advised the Navy Department that the American seaplane in which Ensign Albert Dalton Sturtevant, U. S. N. R. F., was lost is said by the Germans to have been shot down in flames. Ensign Sturtevant was second pilot in the machine.

"Apparently this machine was attacked by ten enemy planes," the dispatch states.

Fiorella P. la Guardia, representative in Congress from New York and a captain in the American flying corps, delivered a stirring address on the war to an enthusiastic audience at the Theatre Argentina recently. The meeting was under the auspices of the Colonial Institute. It was the first meeting since the war began in which the doors of that organization was thrown open to the public.

Representative La Guardia had just returned from the French front and made his return the occasion for accepting the traditional "Roman challenge" to answer all questions regarding the war. His remarks took the form of an analysis of President Wilson's war messages, pointing out their perfect sequence in developing his original idea of achieving a really permanent peace—of conducting a war against war.

Lieut. Harold Kidder Bulkley, of New York, younger son of Edwin M. Bulkley, the banker, has been killed in England in an aeroplane accident, according to the news received at his parents' home. The message did not state when the accident occurred.

Cleveland Plans War Coordination

Several thousand factories in the greater part of Ohio and three western Pennsylvania counties will be consolidated into one organization with every part coordinated in turning out war material, under plans adopted by the Cleveland War Industries Commission. Samuel Scovil will represent the United States Ordnance Department in the district. Questionnaires will be sent to all of the manufacturers. The commission will thus know the number of machines in each plant, those engaged on war orders and the complete available production capacity. The Government can be told quickly what labor conditions are in each plant and will be able to place orders where there is sufficient equipment to turn out finished products quickly.

Blue prints of plans and specifications of Government contracts will be on file in the offices of the commission here. All industries are expected to be represented.



A Caproni biplane making a somewhat precipitous bank.

© Committee on Public Information

E. F. Gay Appointed Member of War Board

Edwin F. Gay has been appointed a member of the War Board by President Wilson. His special task will be to curtail the non-essential industries. Mr. Gay was formerly Dean of the Harvard School of Business Administration.

Mineola Fair Grounds Added to Aviation Field

Work is being started to turn the Mineola Fair Grounds into an aviation field. An enclosed tract of 63 acres, as well as several hundred of acres of land and six buildings will thus be added to the Mineola Aviation Field. Camp Mills, which was used by the Rainbow Division, has been made part of the Mineola Field, and the increased accommodations will provide for 10,000 aviation cadets.

Senate Confirms Aircraft Board Appointments

The Senate confirmed the appointment of Howard E. Coffin as chairman of the Aircraft Board, and Richard How as a member of the board.

A third civilian member of the board still remains to be appointed by President Wilson. It is not known whom the President has in mind.

Clothing Issued to Aviators

The following letter received by Mrs. Wm. Allen Bartlett, chairman of the Aviation Committee of the National Special Aid Society, in response to a communication which she addressed to Major-General George O. Squier, is of great interest to aviators:

O. C. S. O., Supply Division,
Washington, D. C., February 19, 1918

To: Aviation Committee of the National Special Aid Society, Inc., 259 Fifth Avenue, New York City, N. Y.

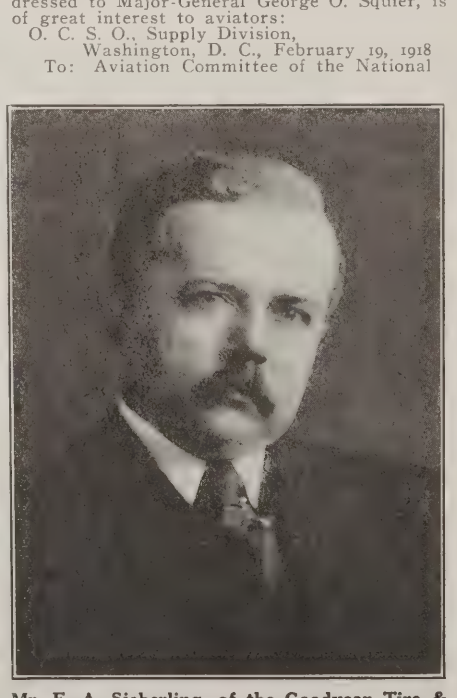
1. From your letter it would seem that a general misunderstanding exists as to equipment which is being furnished the aviators both for overseas duty and at home.

2. Aviators' clothing is being shipped in bulk to be issued to Aviators upon arrival at their overseas destination, and need not be procured prior to embarkment.

3. Equipment for cadets at flying fields is being supplied in sufficient quantities to care for the needs of these students.

4. There was some delay in getting production on equipment for flying students in this country due to a change in the department under whom the purchases were to be made. Your list was taken from the list that was to be purchased by the Quartermaster Department. This clothing is now being purchased by the Signal Corps in accordance with a new list of equipment for flying students.

By authority of the Chief Signal Officer:
(Signed) C. G. Edgar,
Colonel, Signal Corps.



Mr. F. A. Sieberling, of the Goodyear Tire & Rubber Co., who has just been elected president of the Lincoln Highway Association, succeeding Major Henry B. Joy.

Army to Teach Aviation Photography at Syracuse

An aviation photographic school where several hundred army aviators are to be taught in the use of the camera and the kodak, including their repair and up-keep, is to be established at Syracuse, N. Y.

Men are to be sent there from camps and aviation fields for training and new recruits are to be mobilized there.

The aviation photographic school is to be under the Signal Corps of the United States army, and will probably be the only one of the kind completely given over to this work in the country. It is reported that the school will be laid out at once and training begun as soon as the men can be mobilized.

Every Man in Princeton Ground School Insured

Secretary McAdoo announced that every officer and cadet at the Ground School at Princeton, N. J., has taken out the maximum amount of insurance permitted under the war-risk insurance act, or insurance of $10,000 apiece. The total amount of insurance subscribed for by the officers and cadets at the Ground School is $1,864,000.

As far as is known the Princeton Aviation School is the first camp of either the Army or Navy to set a 100 per cent war-risk insurance record.

New Signal Corps Flying Field in California

A new flying field is to be established at Mills Station, a suburb of Sacremento. The site was chosen by W. F. Stephens, land expert on the aviation committee, and although it has not yet received official confirmation from Washington, plans are already under way for the project. The buildings will cover a tract of seven hundred and fifty acres, will cost in the neghborhood of $750,000 and will accommodate eleven hundred student aviators. The camp will be connected with Sacramento by a Government-built railway and telegraph and telephone lines.

Great Aviation Camp Planned in South

Camp Greene, Charlotte, N. C., is to be made a great aviation concentration camp. Plans for this change are now being worked out by the Signal Corps, it was stated by Secretary Baker.

The Third and Fourth divisions of the Regular Army, now at Camp Greene, will complete their training before the change is made. The unassigned units at Charlotte are to be sent to other camps, principally Camp Wadsworth, Spartanburg. S. C.

Chanute Field News

Captain L. C. Collins is the new head of the hospital at Chanute Field. Major Maurice Connolly, the Congressman flyer, has recovered from a severe siege of pneumonia and has gone to his home in Iowa.

Local aviators are pleased over the announcement that Lieut. Pat O'Brien, who recently returned to his home in Momence, Ill., after a thrilling escape from the Germans, may lecture here within a short time. The noted Irishman has written that he will be glad to address the Chanute students if he can arrange a date.

Garros Escapes from German Prison

Lieutenant Roland G. Garros, the famous French aviator, and Lieutenant Antoine Marchal, who flew over Berlin in the summer of 1916 and was forced to descend a few kilometres from the Russian lines, reached Holland yesterday. According to Les Nouvelles, of Maastriche, they escaped from a German prison.

Secretary Baker's Weekly War Review Tells of Raids Over German Lines

Secretary of War Baker, in his weekly review of the war, states that "The industrial districts of Lorraine and Luxemburg, as well as the region of the upper Rhine, were again the targets of allied bombing squadrons.

"The Germans, in turn, killed a number of civilians in raids on Nancy and Paris."

NAVAL and MILITARY AERONAUTICS

AERIAL AGE WEEKLY begins publishing the Special Orders and Promotions in a new form with this issue. The orders are grouped in alphabetical form, according to the name of the officer to whom the order is issued. This enables applicants for commission and officers of the Aviation Section of the Signal Corps in reserve to ascertain what orders have been issued to them without the necessity of reading through pages of orders which do not concern them.

Although this method of preparing the orders involves a very large amount of work, it is believed that officers of the Aviation Section will find these pages of great value to them. All the orders made public each week are included, and every effort is made to make our list complete and accurate. AERIAL AGE is the only publication in which the military orders can be found in a practical, systematic form. The aim of AERIAL AGE being to supply a quick reference for our busy authorities, we will welcome suggestions for improvement in the method of arranging the initials to facilitate reference.

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AHT—Report to Aerial Gunnery School, Houston, Texas.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
DAF—Report to Door Field, Arcadia, Fla.
EEP—Report to Essington Field, Essington, Pa.
EHT—Report to Ellington Field, Houston, Tex.
ELA—Report to Eberts Field, Loanoke, Ark.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parenthesis)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
THT—Report to Taliafero Field, Hicks, Tex. (When specified in the order, the number of the field is given in parenthesis)
TMA—Report to Taylor Field, Montgomery-Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDO—Report to Wilbur Wright Field, Dayton, Ohio.

Note 1.—Burke, John Edwards; report to District Manager of Inspection, 870 Woodward Avenue, Detroit, Mich.

Note 2.—Carruthers, Capt. William H.; report to commanding officers, Signal Corps Engine and Repair Depot, Indianapolis, Ind.

Note 3.—Drueding, Albert J., and Nagle, Walter G.; report to the Commanding Officer, Signal Corps, Radio School, Maryland State Agricultural College, College Park, Md.

Note 4.—Finney, Major John H.; relieved from present duty and assigned to duty with Joint Army and Navy Airship Board.

Note 5.—Howard, Charles Wadsworth; placed on active duty, and report to Major H. L. Shepler, 1836 Euclid Ave., Cleveland, O.

Note 6.—Lawson, Norman; report to Americus, Ga., for duty.

Note 7.—Pickering, Maylin Joseph; report to Commanding Officer, Camp MacArthur, Waco, Tex.

Note 8.—Rudolph, Walter Henry; report to Capt. R. S. Rainsford, District Manager of Inspection, 15 Park Row, New York.

Note 9.—Tone, Fred I.; report to Major C. M. Hall, Dayton, O.

Special Orders Numbers 30 to 37, inc.

A

Ackerman, Edwin De Witt,.....FLR; CSO
Alexander, Ludwell Brooks,.....FLR; MIT
Anderson, Richard H.,.....SLR; FOB
Andrews, Howard B.,.....SLR; FOB
Ames, Norman Bruce.....SLR; CSO
Arnold, Wellington,.....GIT
Aulmann, Robert C.,.....RII
Ashton, Thomas H.,.....SLR
Armantrout, Guy E.,.....SLR; FOB
Ahl, Parker V.,.....SLR; GIT
Andrews, Edward W.,.....SLR
Alexander, Robert N.,.....FLR
Aiken, Herbert W.,.....FLR
Adkissin, William T.,.....FLR
Ayer, Frank,.....SLR
Anderson, Albert M.,.....SLR
Adams, Quinlan,.....SLR
Albrook, Frank P.,.....SLR
Allen, Leroy B.,.....SLR

B

Bretey, Frederick,.....CPR; CSO
Boorman, Sapper Kitchell, M.,.....SLR; CMV
Baker, Alfred,.....SLR; THT
Bridge, Robert Berry,.....FLR; MIT
Brown, Frederick Lyons,.....SLR; CSO
Boyce, William Henry,.....FLR; CMV
Brock, John Beebe,.....FLR; CSO
Blair, Edward,.....FLR; OSU
Bernheimer, Clement M.,.....SLR; EHT
Barry, Arthur H.,.....SLR; FOB
Bonney, Ulysses H.,.....SLR; FOB
Burleigh, Donald M.,.....SLR; FOB
Bond, George A.,.....SLR
Booth, Alfred B.,.....FRF
Brown, Harry L.,.....FLR
Betts, Benjamin Franklin,.....SLR; CSO
Brush, Oliver G.,.....FLR; PFO
Burke, John Edward,.....Note 1. FLR
Brackett, Elmer E.,.....FLR
Bassett, Herbert B.,.....SLR
Bevins, Hugh Albert,.....FLR; GLC
Balkham, Herbert Hewitt,.....SLR; CSO
Bernhard, William,.....FLR; MDO
Brown, Wilbur Trader,.....SLR; RSD
Barber, Thomas L.,.....FLT; GIT
Broun, LeRoy L.,.....FRF
Belcher, Fred William,.....FLR; LDT
Billett, Clifford Henry,.....SLR; LHV
Byerly, Fred M.,.....SLR
Baldwin, Marion Augustus,.....SLR; FOB
Barbey, John E.,.....CAP
Baker, Winthrop P.,.....CPR
Blodgett, Frederick C.,.....CPR
Baker, Howell C.,.....FLR
Ballew, Waldow M.,.....FLR
Banks, Robert B.,.....FLR
Brown, Carl C.,.....FLR
Brown, Harry M.,.....FLR
Brown, William O.,.....SLR
Blackston, Walter F.,.....SLR
Blood, Wayland P.,.....SLR
Barr, Robert J.,.....SLR
Birmingham, Hugh H.,.....SLR
Black, Alexander,.....SLR
Blake, Thomas J.,.....SLR
Blaney, John,.....SLR
Bowefsox, William E.,.....SLR
Brecka, Frank V.,.....SLR
Brooks, Frederick A.,.....SLR
Broome, Raymond J.,.....SLR
Brown, Joseph E.,.....SLR
Bryan, John A.,.....SLR
Brown, William C.,.....SLR
Barmore, Henry D.,.....SLR
Bien, Julius, Jr.,.....SLR
Beers, Donald,.....SLR
Buchtenkirch, George C.,.....SLR
Bennett, Jerry L.,.....SLR
Bailey, Patrick W.,.....FLR
Brown, Glenn W.,.....FLR

C

Carroll, L. Ray.....VBW
Crumay, Samuel Lemon.....FLR; CMV
Coleman, Raymond M. .....SLR; MIT



A Mack AB 2-ton truck used by the Standard Aero Corporation, having a 200 in. wheelbase, used in transporting aeroplane parts, etc.

Carter, James E.....VBW
Coles, Paul David.....SLR; RSD
Cliff, Nelson Alfred.....SLR; RSD
Carlson, Hilding Nathaniel.....SLR; CTD
Cudley, Oscar Lee.....SLR; KST
Cummins, John William.....FLR; CSO
Churchill, Sealy Jack.....SLR; THT (3)
Cory, Wayne Meisner.....SLR; CSO
Conway, William E., Jr.....SLR; KST (2)
Campbell, Eno.....FRF
Cameron, Robert F.....SLR; FOB
Christian, Savias T.....SLR; FOB
Cummings, Roland Reed.....SLR; FOB
Chase, Samuel W.....SLR
Caughey, Arlington R.....SLR
Culp, Alexander B.....SLR
Coxeter, Robert A.....CPR
Clarke, Eugene C.....SLR
Cockingham, Prescott W.....SLR
Cozzens, John.....SLR
Chadwick, Stuart.....SLR
Clowes, Lloyd R.....SLR
Coletti, Vincent J.....SLR
Crummey, James M.....SLR
Clark, James Holbert.....SLR; GLC
Collins, Richard D.....FLR; RSD
Cudworth, Roger L.....FLR; CSO
Christy, Lee A.....FLR; CSO
Coulbourn, Hugh A.....SLR; GIT
Coward, William Barnett.....FLR; RSD
Clark, James H.....FRF
Coe, Frank A.....SLR
Crawford, Russell T.....MJR
Carruthers, William H.....Note 2; CPR
Clark, Anson Luman.....SLR; THT
Carpenter, James V.....FLR
Cochran, Fielding B.....FLR
Crow, William S.....FLR
Chapman, Asel B.....FLR
Couch, Quest C.....FLR
Coleman, James H.....FLR
Cralle, Walter O.....FLR
Caughlin, Charles B.....FLR
Cygon, Leon.....FLR
Crimmins, Frank E.....FLR
Cooper, Ralph E.....SLR
Coogan, Gardiner.....SLR
Cogan, James E.....SLR
Cox, Sidney H.....SLR
Clark, Donald M.....SLR

Carne, Baron D.....SLR
Cartaya, Oscar E.....SLR
Campbell, Harry B.....SLR
Chenoweth, Bertrum W.....SLR
Cummings, Fred J.....SLR
Cullinan, John J.....SLR
Cummins, Albert S.....SLR
Cooper, Joseph W.....SLR
Carter, Jewell L.....SLR
Crawford, James G.....SLR
Crebs, Harry D.....SLR
Campbell, Max W.....SLR
Crooks, R. H.....SLR
Carr, Makey H.....SLR
Carples, Edmond.....SLR
Coboline, Julius A.....SLR

D

Dame, Ralph L.....UTA
Draper, George Otis.....CPR; MIT
Dudley, Frank Barcley.....FLR; GLC
Dawson, Athol Arch.....FLR; RSD
Davis, William Henry.....SLR; CSO
Davis, Paul Orvan.....SLR; KST
Dudley, Frank B.....FRF
Devaney, Leo G.....SLR
Denton, George R. S.....SLR; KST
Dorn, Louis.....FLT; VBW
Drueding, Albert J.....Note 3; SLR
Doolin, Bernard Michael.....SLR; RSD
Dixon, John F., Jr.....FLR
Dixon, William W.....FLR
Doles, Robert C.....FLR

E

Ehrenberg, Conrad E.....SLR
Edgar, Harold Henderson.....FRF; FLR; GLC
Everall, James Rhodes.....SLR; OSU
Ellis, Lyman R.....FRF
Eckman, Elmer Andrew.....CPR; CMV
Ervin, James Robertson.....SLR; GIT
Ennis, Frank Seferen.....SLR; THT (1)
Eddy, Paul L.....SLR
Emery, Forrest Smith.....THT
Edison, Charles G.....FLR
Eaton, St. John L.....FRF
Einig, Theodore.....CMV



French Official Photo

Nieuport combat machines at a French aviation center.

Egan, Francis.....SLR
Ellison, Howard A.....SLR; KST
Edgerton, Harry M.....UTA

F

Fancher, John Thomas.....SLR; RSD
Fairchild, Arthur.....SLR; RSD
Frye, William A.....FRF
Fitzhugh, Thomas C.....SLR
Furham, Daniel K.....SLR
Ferguson, Otto.....SLR
Fischer, Ernest A.....FLT; AHT
Frey, Newt.....FLR; LHV; WCS
Filion, Charles J.....FLR; VBW
Finney, John H.....Note 4
Finley, Robert H.....SLR; FOB
Franklin, Mason E.....SLR; FOB
Frick, Childs.....FLR; CSO
Foss, George A.....SLR
Forshay, Harold J.....FRF
Frith, Edwin H.....CPR

G

Goodman, Richard.....SLR; RSD
Garretson, Ray William.....FLR; RSD
Graham, William R.....FLR
Galleher, Harry E., Jr.....SLR
Gesner, Carleton P.....SLR
Gunther, Abraham L.....CPR
Grey, George V.....FRF
Grey, George Valentine.....FLR; GLC
Gerlinger, Charles.....SLR; FOB
Graham, Guy Everett.....FLR; CSO
Gordon, George Lafayeet.....CPR
Gale, Henry G.....MJR; CSO
Gillern, Maurice F.....SLR; FOB
Godfrey, John S.....SLR; FOB
Green, Warren Kimball.....SLR; CSO
Gordon, Myron Boyd.....SLR; MIT
Gowan, George.....FLR; GIT
Gildersleeve, C. Russell.....FLR; OSU
Grover, Ralph Jerome.....SLR; GIT
Giescke, Bertram E.....LSR
Gadbury, Joseph H.....UTA
Goodfellow, John James, Jr.....FLR; RSD
Gwynne, Harry S.....CPR

H

Hofflund, John Leslie.....SLR; RSD
Hanes, Harold F.....FRF
Hall, Russell F.....FRF
Horine, Merrill C.....SLR; CSO
Howard, Charles Wadsworth.....Note 5; FLR
Harman, Edwin Thomas, Jr.....SLR; THT (1)
Healy, James Andrew.....SLR; THT (1)
Heninger, Roswell W.....SLR; FOB
Hatcher, Ruby F.....SLR; FOB
Hurja, Emil Edward.....SLR; VBW
Hermanns, Edwin Frederick.....SLR; FOB
Hawley, Louis G.....CPR; OHU
Harris, Julian H.....COL
Hotchkiss, H. Stuart.....MAJ
Howard, Frank J.....SLR; AGC
Hahn, Stanley W.....SLR; FOB
Harper, Richard S.....SLR; FOB
Holmes, William H.....SLR; FOB
Hutchins, Don Lee.....SLR; FOB
Hebert, Oscar J.....SLR
Hall, Oliver J.....FRF
Hill, Albert Long.....SLR; CMV
Hendrickson, Charles S.....CPR

I

Ingersoll, Hamilton.....SLR
Immel, Paul P.....FLR; DAF

J

Jacobs, L. B.....MAJ
Jackues, Gordon F.....SLR; FOB
Jernigan, John Albert.....SLR; PMT
Jacobs, Isaac W.....SLR; OSU
Johnson, J. Thad.....FRF
Jenkins, James W.....FLT; FSO

K

King, Royal W.....CSO
Kennedy, Harry James.....SLR; OSU
Kerr, Chichester C.....FLR
Kelly, James N.....SLR
Kingsland, Edwin Russell.....SLR; THT (1)
Kropf, Walter J.....SLR
Kinney, Louis C.....CPR; CSO
Kauch, Robert.....UTA
Knight, Climpson Moore.....FLR; PFO

L

Lorenz, Harold A.....FRF
Lynn, Arthur L.....FLT; GIT
Luke, Frank, Jr.....SLR; RSD
Little, Raymond James.....FLR; RSD
Lundberg, George G.....SLR; FOB
Levison, Jesse A.....SLR
Lewis, Burton Frederick.....FLR; PMT
Lakin, Paul Edway.....SLR; RSD
Landon, Jack.....AAD; CSO
Love, Robert J.....FLR; DAF
Leonard, Herbert L.....CAP; MIT
Littell, Gregory B.....FLR
Lawson, Lawrence A.....SLR
Lawton, Mortimer P.....SLR
Lane, LeRoy C.....SLR
Lilienthal, John Leo.....SLR; MIT
Lane, Ray.....SLR; FOB
Lawson, Norman.....Note 6; FRF; WCS

M

McCullough, Max L.....DAF
Mitchell, John K.....WCW
Mackenzie, Kenneth.....FLR

Mayo, Edward H.....FLR
McKee, Frank M.....SLR
McLafferty, Joel E.....SLR
McLaughlin, Oscar F.....SLR
McQueen, Bruce A.....SLR
Marshall, Robert J.....SLR
McCue, John B.....SLR
McKean, Jacob Egbert.....FLR; GLC
Merrell, Cyrus W.....SLR; FOB
McKnight, Harold Melvin.....FLR; GLC
Harmon, Howard C.....MAJ
Moran, Joseph P.....SLR; GIT
McLaughlin, Ralph D.....SLR; GIT
McKnight, Harold M.....FRF
McKean, Jacob E.....FRF
Mitchel, Henry Gaston, Jr.....FLR; MIT
Merriner, Alfred W.....SLR; MIT
Monahan, Tom K.....SLR
Mahoney, William L.....SLR
McCoy, Daniel C.....AAD; CSO
Montgomery, William Woodrow.....LTC; CSO
MacKeen, William Duncan.....FLR; DAF
McLaurin, King Harrison.....SLR; MIT
Martin, Charles B.....SLR; GIT
McClelland, Harold M.....UTA
McKinnon, Angus G.....FLT
Miller, Ewing H.....FLR; CMV
Mitchel, John Purroy.....AAO; RSD
Mitchell, Robert John.....SLR; RSD
Morris, Edward M.....SLR; THT (1)
McEachron, Wilbur H.....SLR
Myers, Devereaux M.....SLR
Mills, Herbert H.....SLR; FOB
McGinness, Blake Remson.....SLR; FOB
Martin, John R.....SLR; AGC
McInerney, John.....FLR; TMA
McDonough, Charles J.....FLR
Mason, Ernest S.....FRF
Myers, Maurice C.....SLR; PFD

N

Nagle, Frank L., Jr.....CPR
Niedermeyer, Frederick W., Jr.....SLR
Nason, Walter H.....SLR
Neidigh, Leo.....SLR; CSO
Nagle, Walter G.....Note 3; SLR
Nichols, Elmer Everett.....FLR; RSD

O

O'Connor, Kenneth A.....FLR; KST
O'Connor, Charles J.....CPR
O'Brien, Martin J.....FOB
Owen, Hubert K.....SLR; FOB
O'Gorman, William D.....MAJ

P

Peinze, Carl Ernest.....SLR; FOB
Preston, Lewis B.....CPR
Penny, Thomas, Jr.....SLR
Penick, William M.....FLR; CSO
Pliska, Joseph S.....AAD; MIT
Peterson, Ernest Jensen.....SLR; RSD
Poe, William L.....UTA
Pollock, John.....ELA
Patterson, Fred R.....SLR
Peddycoart, Clinton M.....SLR
Plettner, Walter E.....SLR
Pearson, Joseph R.....FLR; GLC
Pittman, Wayne V.....SLR; MIT
Post, George Browne, Jr.....SLR; GIT
Pearson, Joseph R., Jr.....FRF
Potter, Robert S.....CPR
Patterson, J. McNeil.....CPR
Pickering, Maylin Joseph.....Note 7; MJR
Pfaff, Leo George.....SLR; FOB
Peck, Theodore A.....SLR; PFO

Q

Queisser, Robert L., Jr.....FLR; MIT

R

Riedel, George D.....SLR
Reynolds, John F.....FLR
Richardson, Tracy.....CPR
Rahn, John C.....SLR
Reynolds, James T.....PUP
Royal, James M.....SLR; MIT
Richardson, James H.....SLR
Renwick, Ralph.....SLR
Ramsey, James Nelson.....SLR; FOB
Russ, Glenn Francis.....FLR; KST (1)
Roberts, Ivan Andrew.....SLR; THT (1)
Renfro, De-Grimm.....SLR; KST
Robinson, John Howard.....SLR; RSD
Rice, Marcus H.....AAD
Reese, Lewis R. P.....UTA
Ronalds, Reginald.....UTA
Raney, Chester.....SLR; VBW
Reynolds, James T.....HHN
Rosenfeld, Reuben.....HHN
Rudolph, Walter Henry.....Note 8; SLR; WCS
Roe, Joseph Wickham.....CPR; CSO
Rickard, Clyde H.....FRF
Rollins, Millard E.....FRF
Roepke, William Jones.....CPR; MIT

S

Schelling, George.....UTA
Sweeney, Ben Augustus.....SLR; KST
Smythe, Clifford Earle.....FLR; FOB
Stevenson, Frederick DeWitt.....FLR; MIT
Schellberg, Harry Edward.....SLR; FOB
Shoptaw, John W.....SLR; FOB
Simpson, Lawrence Guild.....SLR; FOB
Spence, DeWitt Talmage.....SLR; FOB
Stevens, Albert.....FLR
Sloan, Kellogg.....SLR
Squier, Merrill A.....SLR
Scribner, Carleton S.....SLR
Sugarman, Morris H.....SLR; CGS
Schoepf, Alfred W.....SLR; CGS



French Official Photo

German combat machine forced to land in France.

Simpson, William D.....SLR
Scott, Grant E.....SLR
Slattery, Frank E.....SLR
Steward, Lewis H.....SLR
Sapiro, Milton D.....SLR; FOB
Southard, Alfred Mansel.....SLR; RSD
Schoen, Karl John.....FRF
Scott, Thomas Richard.....FLR; GLC
Schricker, John W.....SLR; AGC
Sherman, Cecil Kent.....FLR; CSO
Struthers, Bruce.....SLR; RSD
Sullivan, Leonard.....SLR; RSD
Stearns, Earl D.....FLR; MIT
Spencer, Graham.....SLR; CGC
Smith, Howard.....SLR; LHV
Swan, Harry Roswell, Jr.....FLR; GIT
Swem, John Broadus.....SLR; RSD
Scott, Towsend, Jr.....UTA
Stockard, Lester N.....SLR; KST
Schmidt, Henry Duncan.....SLR; CSO
Sullivan, Carl Emery.....FLR; CSO
Shupp, Burton A.....UTA
Stein, Carroll V.....FRF

T

Trapp, William C.....FLR; CSO
Tone, Fred I.....Note 9; CPR
Thompson, Richard E.....SLR; FOB
Taylor, James G.....SLR
Thummel, George B.....SLR
Tommers, Andrew E. B.....SLR
Talbot, William C.....VBW
Thompson-Nelly, James M. G.....SLR; FOB
Tower, Walter Sheldon.....FLR; CSO
Thurston, William Harris, Jr.....FLR; CSO
Tracy, Ernest B.....AAD; CSO
Taylor, Miller Robert.....CPR; EHT

V

Valle, Paul.....SLR; RSD
Vredenburg, Raymond T.....SLR; FOB
Vieh, Walter F.....SLR; CSO
Valiant, Frank L.....UTA
Van Vleck, Peirce.....SLR
Verheyden, Edward J., Jr.....SLR; FOB
Vincent, Jesse G.....LTC
Van Webelstaedt, Henry A.....GIT

W

Welch, Clarence H.....SLR; FOB
White, Roy Whiteworth.....SLR; RSD
Wiley, Silas Moore.....FLR; CSO
Wheeler, Donald B.....SLR; MIT
White, Frederick G.....FLR
Watkins, Kenneth.....SLR
Watson, Forrest F.....SLR
Welch, Wallace C.....FLT; AHT
White, Henry C.....CPR; FOB
Wells, Roe Edwin.....SLR; RSD
Weaver, Hal. C.....SLR
Wylie, Laurence.....SLR
Weaver, Frank R.....SLR
Wells, Harold Raymond.....SLR; RSD
Waters, George Jason.....FLR; CSO
Washington, Bushrod Corbin.....FLR; CSO
Wotipka, Walter M.....FRF
Wishard, Leslie M.....FRF
Williams, Sanford E.....SLR; FOB
Warrum, Andrew.....SLR; RSD
Whitney, Reginald Ward.....SLR; KST
Walmsley, T. Semmes.....CPR

Z

Zehner, Harley W.....SLR; AGC



MEMBERS OF THE FRENCH AVIATION MISSION TO AMERICA

Front row, reading from left to right: Lieutenant Espanet, Captain De Berroeta, Major Tulasne (Commandant), Captain Lepere, Captain De Guiche, and Lieutenant Marmier. Second row: Lieutenant Sergent, Lieutenant Lapachet, Lieutenant Vidalie, Lieutenant Tabuteau, Lieutenant Gueret.

Ambassador Sharp Tells of American Aviation Camp in France

A city of 4,500 inhabitants where, six months ago, there was a vacant field; many of the finest physical and intellectual specimens of America's young manhood vying with one another in mastering the art of flying, and hundreds of aeroplanes continually hovering or spiralling overhead, are facts which caused William G. Sharp, the American Ambassador here, enthusiasm and delight at the achievements of the aviation department of the American army when visiting the largest American aviation camp in France a few days ago, according to the Associated Press.

The ambassador said he was greatly impressed by the work accomplished in the short space of time, as ground at the aviation camp was only broken last August.

The boys are working under ideal conditions. Modern sanitary methods have been adopted and baths and swimming pools installed. The Red Cross and the Young Men's Christian Association have organized recreation and amusement places, and the camp gives one the impression that it is the campus of a large American university. A large percentage of the men are university undergraduates.

The French officer of instruction told the ambassador the American youths are marvellous fliers, quick to learn, courageous and energetic, and will develop rapidly into "aces" comparable to the renowned men in other armies. The men are given thorough preparation in this camp, but have to take a post-graduate course at another aviation camp near the front for a few weeks before going over the lines to face the Germans. The full-fledged aviators turned out daily at this camp are immediately replaced by other novices.

"It was a most inspiring sight," Mr. Sharp said. "The men radiate with strength, physical and mental. They have great spirit and confidence and are eager to 'do their bit.' "

Nearly all the men in the flying force are trained athletes. Another hundred men are attending a French camp nearby.

Daniels Asks $230,077,152 More for Navy

Congress was asked by Secretary Daniels on February 18 for $230,077,152 to further expand the navy's great building programme, provide for more ordnance and ammunition, cover additional pay for an expansion of the Marine Corps from 30,000 to 50,000 men, and to meet other expenses not contemplated in this year's appropriation bill.

Of the total $100,000,000 is for additional construction and to speed up construction now under way. Mr. Daniels said most of this amount would be spent for vessels "smaller than cruisers," and explained that the unparalleled rapidity with which some yards were turning out destroyers had made it possible to place more contracts for these boats than had been thought possible.

Germany Lists 28 Airmen Who Have Downed 12 or More Machines

Twenty-eight aviators figure in the monthy "roll of honor" issued by the German military authorities on January 1. This list, which is the latest found in German papers reaching London, contains only the names of aviators who have brought down twelve or more enemy machines. It is headed by Major Baron von Richthofen with sixty-three. The next nearest is Lieutenant Max Müller, with thirty-six, who was killed in action only a few days later. Second place now goes to Lieutenant Buckler, with thirty victims to his credit. There are eleven men with more than twenty victims.

The roll of honor no longer contains the names of airmen known to have fallen, but one, Lieutenant Dostler, with a record of twenty-six enemy machines, is marked "Missing."

THE F. B. A. FLYING BOAT



A French F. B. A. flying boat.

THE Franco-British Aviatoin (Société Anonyme), Paris, was founded in 1914 by Lieut. Jean de Conneau of the French Navy (better known as André Beaumont), winner of the Paris-Rome, Circuit-European, and Circuit-of-Britain races, and M. Schraeck of the French Wright Company, to work patents pertaining to the Donnet-Lévêque and Artois flying boats.

These boats, equipped with Gnome, Clerget, or more often Hispano-Suiza engines, have proved to be fast and well suited for high-speed coastal flying. All the Allies, but more particularly France and Italy, are largely using the F. B. A. boats for over-water fighting, and much good work has been done with them.

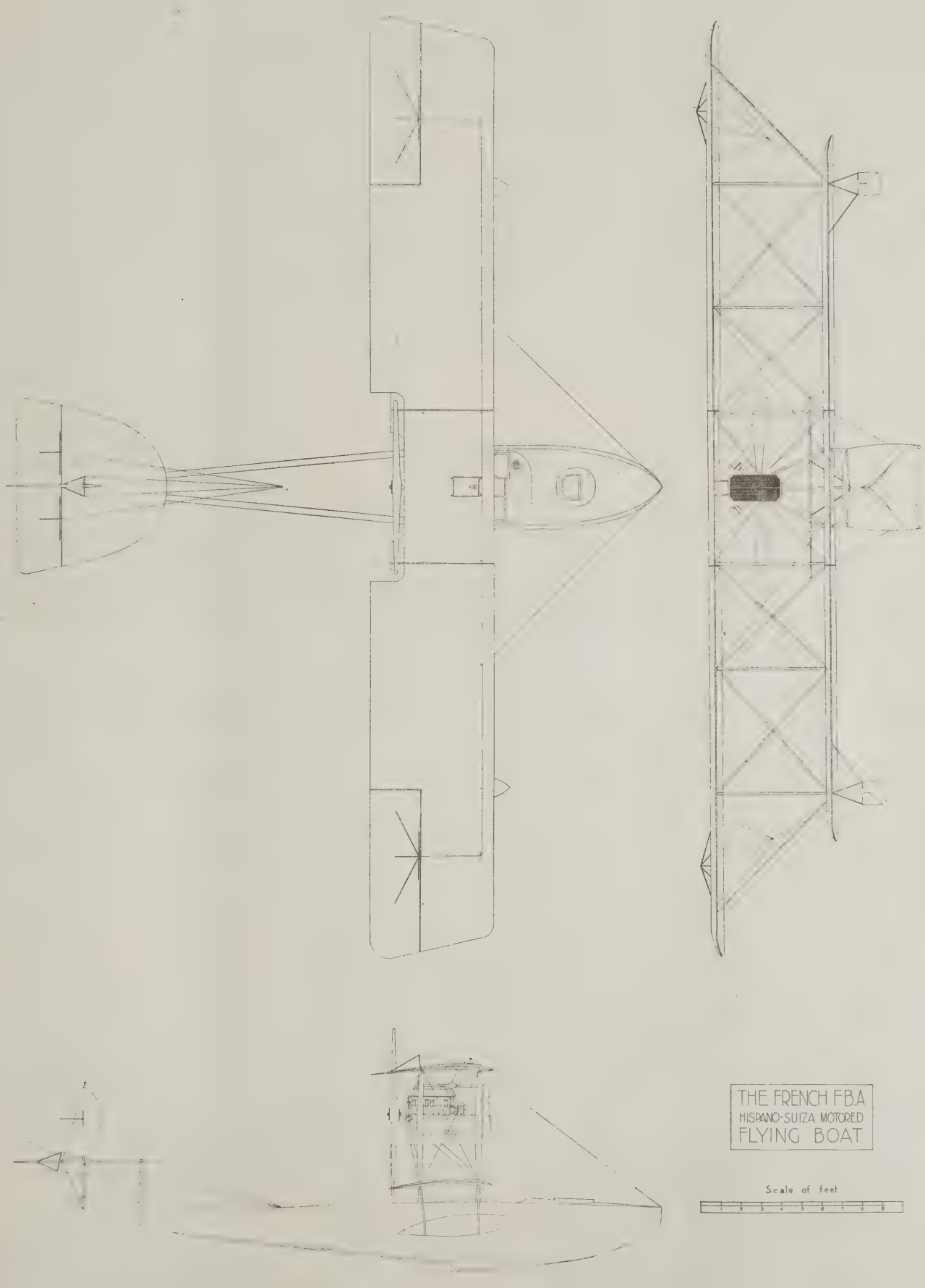
The power plant consists of an 8-cylinder V-type Hispano-Suiza engine developing 150 h.p. at 1,450 r.p.m. (at sea level). Bore, 4.7345 inches; stroke, 5.1182 inches; piston displacement, 718 cubic inches.

Weight, including carburetor, two magnetos, propeller, hub, starting magneto and hand crank (but without radiator, water, oil, exhaust pipes or propeller), 445 lbs. At 1,450 r.p.m. the average fuel consumption is .5 lb. per h.p. hour, and oil consumption, 3 qts. per hour.

Further details concerning the engine were published in the April 9, 1917, issue of AERIAL AGE.



Caleb Bragg and Philip Boyer in their F. B. A. flying boat just before the start of the flight.



[Drawing Passed by Censor.]

MILITARY AIRCRAFT AND THEIR ARMAMENT

By JEAN ABEL LEFRANC *

THE technical elements to be considered in aerial combat are based upon the qualities of the aeroplanes engaged, such as armament, speed, facility in handling, altitude capability, etc. These tactical and technical elements may be divided into two sorts, which though very different are intimately connected.

The combat begins by a series of tactical maneuvers by means of which the assailant seeks to get as many initial advantages on his own side as possible by surprise, by a greater altitude, by a group attack, by a rear attack, etc. It is ended by the actual contest between the machines, continued until one side or the other is destroyed or put to flight.

It is evident that the preliminary tactics can be executed only if the technical qualities of the aeroplane make them possible. Freedom to choose between engaging in combat or avoiding it implies superiority of speed. If the machine possesses the four technical superiorities of the ideal aeroplane, speed, climbing, armament, ease of handling, then its pilot has all the tactical advantages on his side.

But an aeroplane may have a single one of these technical superiorities yet be unable to gain any tactical advantage therefrom. For example, the Voisin gun-pusher, with its 37 caliber rapid fire guns was superior in armament to most of the enemy aeroplanes of that period; but since it had no speed, was not easy to manage; and could not rise, in practice, above a height of 2,500 metres (8,125 feet), it was almost never able to profit by its advantage of armament. The enemy aeroplanes profited by their speed and facility of management to attack it without getting within its very limited range, their superiority in climbing enabling them to refuse combat by rising to a height of 5,000 meters (16,250 feet). The technical elements are identical in all aeroplanes of the same type, but their employment is combat, i.e., their tactical application varies with the ability of the individual pilot in each particular case. The utilization of the tactical elements is so dependent upon their intelligent application by the pilot that it often occurs that aeroplanes technically inferior in all points obtain tactical advantage by reason of the courage and skill of their pilots, and even absolute victories, over adversaries better armed, faster, and more easily handled, *e.g.*, the old Farmans of 1915 over the Aviatiks of that year.

Our (the French) "Aces" in particular furnish an excellent example of good tactical handling of their machines. In general, however, it must be admitted that technical superiority is the surest method of achieving tactical superiority in the fight. Superiority of material equipment has been the chief basis of all German tactics in terrestrial combat.

The relative importance of each of the technical factors in air fighting varies according to the work required of the machine. For a fighting aeroplane the order of importance is as follows; speed, ease of handling, armament, and altitude. The German pilots who have been taken prisoners declare that the superiority of the Nieuport and the Spad over the "chaser" Albatross lies chiefly in their extreme ease of handling, the other factors being practically balanced.

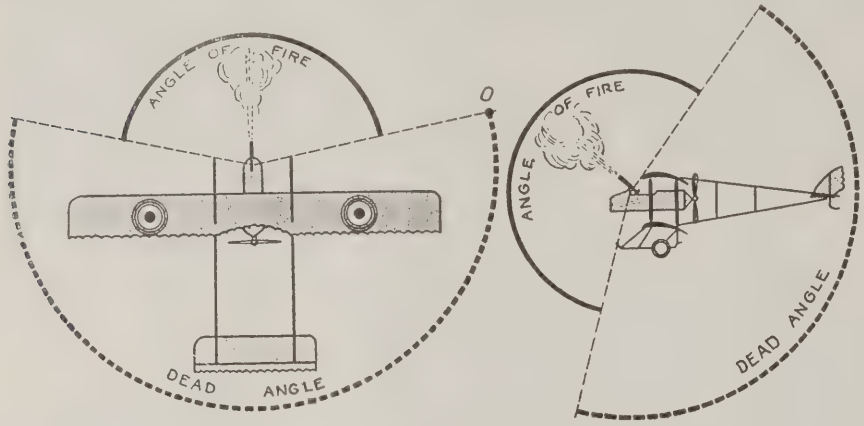


Fig. 1.—Firing area and obstructed area of a 1915 Farman

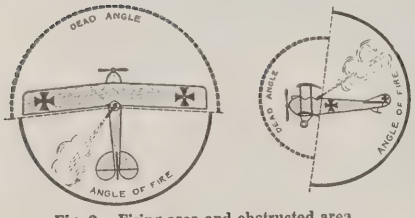


Fig. 2.—Firing area and obstructed area of a 1915 Aviatik

Aeroplanes for artillery, photography, petty bombardment, or protection if by reason of their specialization of function cannot be made fast enough to avoid combat, should be constructed with a view to technical superiority in defensive armament. Handling and speed are less important elements than for fighting machines.

The big aeroplane intended for bombardment by night demands entirely different technical qualities, such as capacity, radius of action, facility in landing, etc.

The present speed of French and German chasing aeroplanes varies between 180 and 200 kilometers per hour (110 to 123 miles per hour); it might be much greater but for the fact that these machines are obliged to keep enough wing-area to enable them to raise their weight of a thousand kilograms (2,200 pounds) to a height of five or six thousand meters roughly speaking, (16,000 to 20,000 feet), and to land on a chance terrain without being upset.

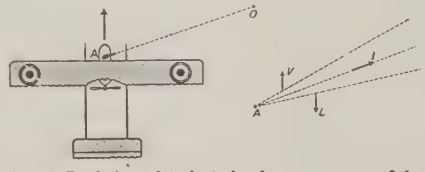


Fig. 3.—Deviation of trajectories in consequence of the displacement of the airplane

The present speed of aeroplane of artillery, photography, petty bombardment, and protection is from 125 to 150 kilometers per hour (75 to 90 miles), while that of aeroplanes for night use may easily remain as low as 90 to 120 km. per hour (50 to 65 miles), in case the exigencies of capacity demand it.

No limit is set to improvement in ease of handling, especially in machines specialized for combat. Knowledge of the formidable strains and pressures which come into play on surfaces of an extent of 25 square meters (the spread of the Albatros chaser) has arrived at such a point of precision that all sorts of aerial acrobats are permissible, especially for chasing aeroplanes without any fear, normally, of ruptures or deformations.

If there are still numerous accidents due to ruptures they must be ascribed to inevitable imperfections caused by the necessity of producing large quantities of machines in a short time and of entrusting delicate bits of construction to mechanics too hastily trained.

Facility in maneuvering is a function of the judicious distribution of the strains to which the aeroplane is subjected; the ascentional strain, gravity, and the strains resulting from the use of the controls.

But, after all, the armament remains the decisive factor in the combat, for it is this which destroys the power of the enemy.

I.—At the beginning of the war, when aviation had a relatively obscure role, and had not assumed the importance of a factor indispensible to victory, the necessity of the "mastery of the air" had not yet made itself felt, and aerial combat was a rare event. The aeroplanes went out armed with a carbine or rifle, and were generally careful to refrain from attacking. Then, little by little, each desiring to keep secret his own preparations, but seeking to know those of the enemy, combats became frequent. It became necessary hastily to mount machine guns with improvised supports which had to be perfected very rapidly. This was the first period of aerial combat, which had scarcely more than a single formula of armament. The aeroplanes, all two-seaters, were provided with a machine gun operated by the passenger.

The majority of the French aeroplanes, having the propeller at the rear, had behind them a considerably obstructed area or blind spot which favored surprise attacks. The machine-guns, being generally placed on a pivot in the front of the nacelle, either to the right or to the left, made it difficult to defend the aeroplane on the sides (Fig. 1).

The German machines, having the propeller in front, had the machine gun at the rear. Their weapon was quickly mounted upon a pivoted turret which permitted it to be rapidly turned in order to fire to the right or the left. The obstructed area was in front and under the observation of the pilot (Fig. 2).

It was quite surprising to observe how often furious combats at a short distance had no practical results except for a few balls in the wings. In the first place the munitions were limited. Either a few belts of 25 cartridges each or a drum of 100. The functioning of the machine guns was delicate, the supports not very practical, and the precision of the fire incredibly defective. The causes of this inaccuracy were many, proceeding chiefly from errors of aim due to the relative speeds to the two combatants; but owing likewise to the very considerable vibration produced by these over-light machine guns, which prevented all accurate aim: also to the inconvenient positions the gunner was obliged to take in order to fire in the direction O as shown in Fig. 1; and finally to the difficulties in handling a heavy arm in a wind of 100 km. per hour (60 miles per hr.).

Moreover, the trajectories of the shots fired, at the side, toward O (Fig. 3), were thrown out of line by new forces: the initial lateral speed, produced by the speed of the aero-

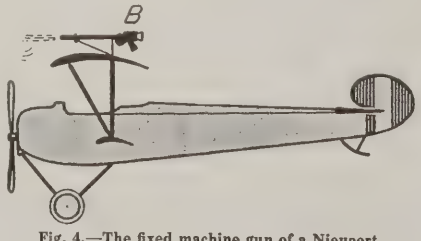


Fig. 4.—The fixed machine gun of a Nieuport

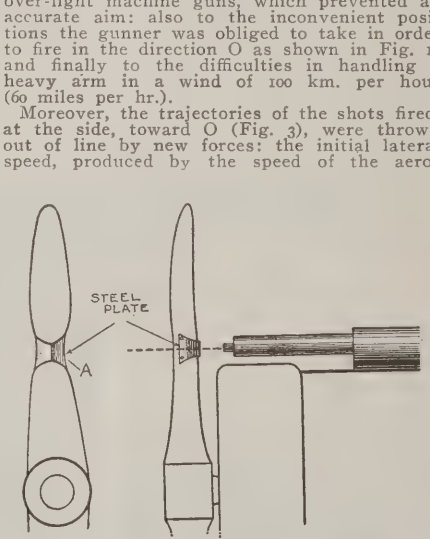


Fig. 5.—Garros type propeller for firing between the blades

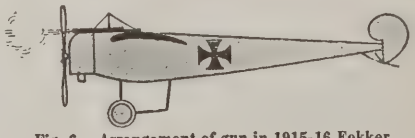


Fig. 6.—Arrangement of gun in 1915-16 Fokker

*Courtesy of *Scientific American* and *La Nature* (Paris).

plane (force V Fig. 3), the lateral wind pressure upon the projectile by this same speed (force L Fig. 3); two forces V and L which are compounded with the initial speed I of the ball and deform the trajectory.

The sight of the gun, moreover, ceases to give a precise indication for arms which fire almost vertically, above or below, and but rarely in a horizontal plane. The distance of the shots is generally less than 400 meters (1,300 feet) and if we note this element of error it is merely to add it to the preceding causes to show the great difficulties involved in aerial firing.

II.—The second period comprises the organization of the armament on board aeroplanes of specialized missions. Three principal formulas have been adopted by our enemies as well as by us:

1. Firing forward by a fixed machine gun shooting above the propeller or through it (one man machines).

2. Firing forward by fixed machine guns shooting like the preceding, but with the addition of a machine gun on a tourelle shooting towards the rear (two-seaters).

3. Firing forward by a machine gun on a tourelle, towards the rear by a machine gun on a tourelle, and under the fuselage with the gun on a pivot (three-seaters).

The constructors have been led to study the formula of fixed firing towards the front, either through the propeller or above it, in the first place to enable one-man machines to become fighting machines, and next to avoid all the inconveniences indicated above in the case of movable guns on tourelles or pivots.

Evidently the first result of employing a fixed gun is to enable the pilot of a one-man machine to operate his own weapon. The gun fires in the axis of the aeroplane; the pilot aims at the object with his entire machine; the aim is accomplished by a sight strictly parallel to

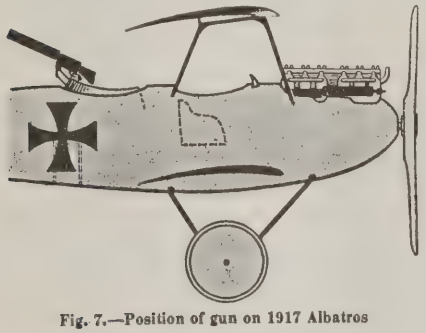


Fig. 7.—Position of gun on 1917 Albatros

the gun. In the second place, since the gun is fixed and consequently forms a solid part of the whole mass of the aeroplane, all firing vibration is suppressed.

Other advantages result from this arrangement of the gun, the excellent position of the pilot gunner, no more deviation produced by lateral wind (force L Fig. 3) and by the initial speed of the aeroplane (force V); this force V

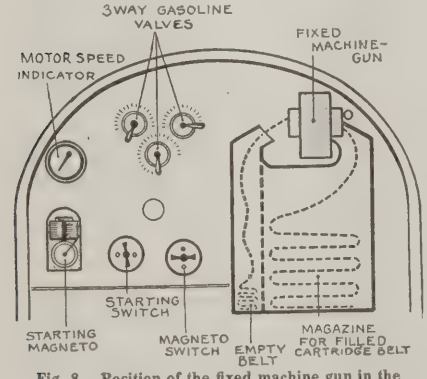


Fig. 8.—Position of the fixed machine gun in the fuselage (as seen by the pilot)

is transformed into a supplement of the initial speed of the ball.

1. The first application of the fixed gun firing above the propeller dates from the appearance of the Nieuport chasing biplanes, (Fig. 4). This machine gun was placed above the top plane, and fired above the propeller. The principal inconvenience of this position, outside the great resistance to forward movement, was the difficulty of loading the arm. To reload the gun the pilot turned it upside down in B, and was then able to remove the discharged disk and replace it with a new one containing 47 cartridges. These 47 shells were

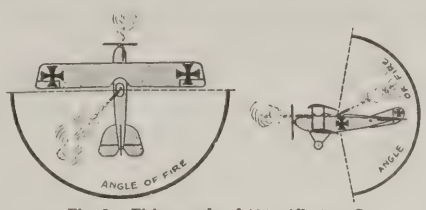


Fig. 9.—Firing angle of 1917 Albatros C

quickly fired at the rate of three or four hundred per minute.

It is easy to fancy the difficulties encountered by the pilot, who not only had to drive his machine, but fire and reload his weapon. In fact, if the pilots of the first Nieuports did not obtain a decisive result with the first disk, they were obliged to stop fighting. The second application of the fixed machine gun was the shooting through the propeller, first practiced by Garros. At first thought the principle of this seems extremely curious. The gun was



Fig. 10.—Firing of the two fixed machine guns in the forward part of 1917 chasing Albatros

fired in the normal manner. To keep the balls from striking and breaking the blades of the propeller two plates of extremely hard steel were fitted onto the blades at the point where the balls passed (Fig. 5). The balls which hit these plates were deflected and lost, but the others passed between the blades and continued their course towards the objective. The percentage of balls lost was negligible, being less than seven or eight per cent.

But a latent defect soon brought about the abandonment of this arrangement; this was a loss of speed on the part of the aeroplane of 20 km. per hour (65,000 feet or over 12 miles). As a result of its transformation the propeller lost a part of its tractive force, a reduced efficiency resulting from the tapering at A, a reduction of the pitch of the propeller being made to compensate the resistance of the steel plates, and thus maintain the motor in its normal action (Fig. 5).

This technical superiority of armament could not compensate in a chasing aeroplane for the tactical inferiority proceeding from a lack of speed.

The third application of this formula was invented by the Germans at the time their Fokker chasing single-seater appeared (Fig. 6). The fixed machine gun fires through the propeller, but it is governed by the motor, its action being synchronous with that of the motor. The propeller making 1,400 revolutions per minute, and having two blades, it is obvious that the barrel of the gun is crossed by the blades 2,800 times per minute, hence the regulation of the firing must be sufficiently precise to permit the balls to pass in these intervals (a 46th of a second).

The control of the machine gun by the motor is effected by suitable gearing (Fokker, Albatros, D. Halberstadt, etc.), or by flexible transmission (Albatros, C. Rumpler C). The pilot operates his weapon at will by pressing on the grip of a Bowden control.

This application of firing through the propeller by synchronization of the machine gun with the motor is the arrangement adopted on the majority of aeroplanes, whether belonging to the French, the Allies, or the enemy. The gun as sheltered under the hood of the motor (Fig. 7), its feeding is easy, and likewise clearing it of empty magazines. The cartridge boxes (Fig. 8) are capable of holding belts of 800 to 1,000 cartridges per weapon.

The chasing aeroplanes are usually one-man machines, it being found preferable to omit the observer to obtain a machine which is speedier, easier handled and capable of going higher and farther.

The German series of Albatros D I, D III, Halberstadt Roland D, Ago D, Fokker D, have two fixed machine guns firing through the propeller, and each provided with 1,000 cartridges (Fig. 10).

2. Another formula of armament (Fig. 9) exists for less rapid two-man aeroplanes, charged with the mission of directing artillery fire, taking photographs, or making petty bombardments. This series corresponds to the Albatros, Rumpler, Aviatik, L V G., the whole series of C, two-seaters, flying only from 140 to 160 km. per hour (cc. 85 to 97 miles).

Their armament is defensive; a forward machine gun fires through the propeller, this being of special service when the defence of these machines require them to attack, and a rear machine gun is mounted on a tourelle. The French have likewise adopted the same arrangements for their areoplanes of equivalent series.

The forward machine gun is generally quite as powerful an arm as the weapon employed by the infantry. The rear gun on the tourelle is a much lighter arm. The fixed machine guns are fed by belts, the mobile guns by belts rolled on reels or by disks (Figs. 11 and 12).

3. The third formula of armament in present use is that which is applied to the three-seat aeroplane, whether constructed for protection or for bombardment (Fig 13). This is an aeroplane whose armament is essentially defensive; to free the forward part of the fuselage the aeroplane is constructed with two motors or two propellers. In this category came the Gotha type G, Frederichhafen G, A E G. G, and Rumpler G. This series of aeroplanes is very recent; their speed appears to be in the vicinity of 150 km. per hour (about 90 miles) a speed equivalent to that of the aeroplanes for direction and for photography, series C.

They seem to have been designed for protection of definite points and lines, or for protecting machines, directing artillery, or for executing heavy bombardments (London).

Their armament comprises a movable machine gun on a forward tourelle, a movable machine gun on a rear tourelle, and a movable machine gun on a pivot, the latter fired through a trap for the lower fire under the fuselage. These strongly armed aeroplanes are difficult to attack, since any machine approaching them is inevitably under fire from one of their guns. The best tactics to pursue against one of these fortresses of the air is, evidently, to fatigue the rear gunner, who can be forced to keep in constant motion between his tourelle and his lower trap if the chasing aviator harasses him sufficiently by his acrobatics.

This type of aeroplane of heavy tonnage



Fig. 11.—Parabellum mitrailleuse movable on a tourelle

A, lateral reel carrying a band of 250 cartridges. *B*, sack into which the shells are ejected. *C*, jointed fork. *D*, carriage revolving on the turret. Weight 12 kilograms (26 lbs); with 250 cartridges and accessories, 32 kg. (70.4 lbs.)

ought to be increasingly developed, as the protection of the average aeroplane becomes more and more difficult, and long distance bombardments is necessary either to paralyze certain industries or to make reprisals on enemy cities. If the adoption of a fixed gun firing in the axis of the route pursued by the machine suppresses a portion of the strains which derange the firing, it still remains to overcome all these difficulties for the mobile guns, and it is necessary also to improve the accuracy of fire of the fixed guns due to the relative speed

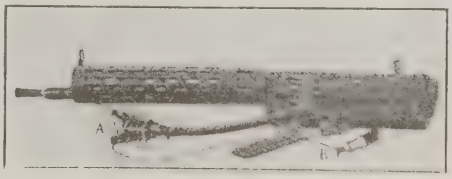


Fig. 12.—Fixed Maxim machine guns

A, arrangement for synchronizing from the motor; *B*, grip of bowden control governing the fire. Weight 13.3 kilograms (29.26 pounds). With 500 cartridges and accessories 26 kg. (79.2 lbs.)

of the machines. A correction of the aim is indispensable—it is this which the hunter does when he sees a head of game in motion.

The correction to be made is considerable if the routes of the two aeroplanes are perpendicular to each other (Fig. 14). While the ball is traversing the course A B the aeroplane B will be at C. It is necessary therefore for A to aim according to the line A C, i.e., with the angle B A C which measures the correction.

The correction is less in the case of Fig. 15, and nil in that of Fig. 16.

To obtain great precision of fire it is of advantage therefore to attack the enemy when as nearly as possible in the position of Fig. 15; the machine thus attacked will avoid, so

(*Continued on page* 1124)

THE AERODYNAMIC LABORATORY AT LELAND STANFORD JUNIOR UNIVERSITY AND THE EQUIPMENT INSTALLED WITH SPECIAL REFERENCES TO TESTS ON AIR PROPELLERS

By WILLIAM F. DURAND

(*Continued from page* 1072)

Tests and Calibrations of Apparatus

Air Propeller.

No matter what the type of air tunnel, the circuit may be considered as closed. If the circuit is complete and such as to hold the air under restraint throughout the entire round, the closed character is evident. If, as in the Eiffel type, the air is delivered to one end of a room and drawn from the other, the return outside the tunnel may be viewed as through the room. The room may furthermore be considered as of any size, and in the extreme case we may suppose it infinite in dimension, in which case the air may be considered as delivered at one point and drawn in at another.

From this viewpoint the problem is, therefore, that of establishing and maintaining a continuous flow of air in a closed circuit. The energy required will then be obviously the energy dissipated in the circuit. If no energy were so dissipated, the air circuit once set up would continue indefinitely. There is, however, a continual dissipation of energy in the form of turbulence due to surface resistance and unavoidable formation of eddies and irregular turbulent motion. This loss the fan or its equivalent must supply.

In considering the operation of the fan we may most conveniently compare the power actually required at the fan with the kinetic energy in the air flowing through the throat of the circuit. This gives, then, a comparison between the energy dissipated in the total circuit, including the fan and the kinetic energy in the air at the throat.

Assuming normal atmospheric pressure and temperature in the outside room, and with due allowance for the slightly diminished density at the collector delivery, we find for the kinetic energy at this point the values shown in table 2, column 3, while test of actual fan imput showed the values as given in column 4. These values indicate for the speeds employed a relation given substantially by the following:

Energy dissipated $= 0.86 \times$ kinetic energy of air at throat.

The relation of wind velocity to fan revolutions and of wind velocity to fan horsepower are shown graphically in figures 9 and 10, respectively.

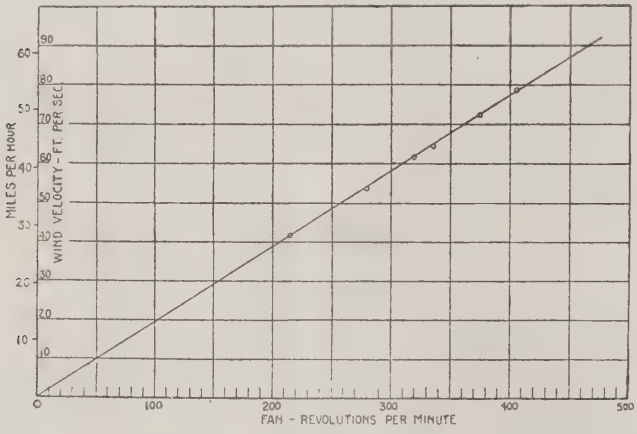


Fig. 9

TABLE II.

Fan.	Wind velocity per second.	Kinetic energy wind stream.	Fan.
Revolutions per minute.	*Feet.*	*Horsepower.*	*Horsepower.*
215	41.7	3.68	3.32
279	53.8	7.86	6.40
320	61.8	11.95	10.00
336	64.6	13.60	11.70
376	72.8	19.45	16.35
406	78.8	24.70	21.95

Uniformity of Velocity Over Cross Section of Air Stream

Surveys were made over the cross section of the air stream in order to determine the variation of velocity in time at any one point and from point to point over diameters horizontal and vertical.

These indicated a mean variation of velocity head on distance of about 2.5 per cent or a mean variation of velocity of 1.25 per cent. The variation of velocity at any one point with time was substantially the same. A Pitot tube survey of 20 well-distributed cells of the honeycomb baffle showed, just in front of the delivery plane, a mean variation of velocity head of 0.7 per cent. The time variation of a single cell was similarly 0.8 per cent. These correspond to velocity variations of one-half the above values.

Relation Between Diameters of Wind Stream and Diameter of Stream Velocity

This relation was based on Pitot tube determinations of velocity and manometric balance measures of the difference of pressure acting as an air head. Numerous determinations of this relation were made at the start of the work and they were repeated daily throughout the tests in order to detect any tendency toward change in this relation.

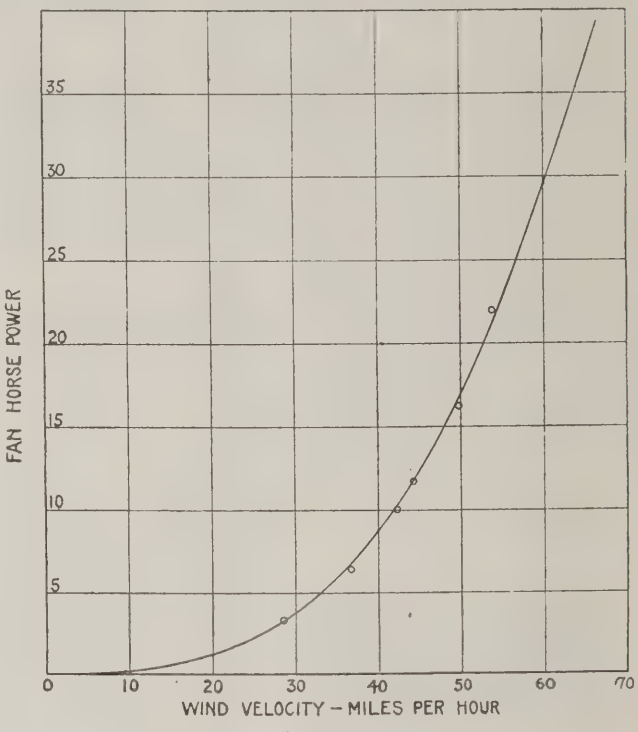


Fig. 10

The relation was found practically constant and as the result of large numbers of determinations was taken as:

$$\text{Velocity head} = 0.876\ (P_1 - P_2)$$

where P_1 and P_2 denote the pressure heads without and within the experiment room.

It should be noted that when the model propeller is in operation with a velocity sufficient to give a positive slip and hence an additional accelerating effect on the air, we have in effect an additional fan in the system and hence must expect an increase of velocity of air stream. This effect on the air stream will also be twofold, as follows:

(1) Local and immediately in front of the model propeller, where there will be acceleration of the air as it approaches the propeller.

(2) Outside the immediate local influence of the model propeller where there will be an increase in air stream velocity due to the greater amount of energy supplied in the circuit and a corresponding reduction in pressure in the experiment room with consequent general increase in the speed of inflow. It was, therefore, important to ascertain whether the general velocity of air stream as indicated by that of the cylindrical shell about the propeller still remained in the same relation to the fall of pressure within the experiment room.

Careful and repeated tests showed that this was the case, and it was, therefore, assumed that the combined action of the large fan propeller and the model propeller was to produce a velocity of wind stream in the cylindrical shell surrounding the model, standing in the given and fixed relation to the depression caused in the room by the joint action of the two propellers. This velocity of wind stream then corresponds to the indefinite stream flowing around and outside of the propeller in the case of an aeroplane in free flight, and is, therefore, to be taken as corresponding to the velocity of flight through the air.

Similarly the local result immediately in front of the model propeller is to be taken as similar to the local acceleration of the air immediately in front of the aeroplane propeller, causing a local flow of air aft to meet the forward moving propeller.

Relation Between Diameters of Wind Stream and Diameter of Model Propeller

It was assumed from precedent and from general experience in wind-tunnel work that a propeller model 3 feet in diameter could be properly run in a wind stream 5½ feet diameter without sensible disturbance at the boundaries of the stream, and hence with sensibly the same result as though in an indefinite stream.

The experimental examination of this question was approached from three different directions, as follows:

(*a*) Successive reduction of wind-stream diameter with comparative study of thrust and torque coefficients.

(*b*) Pitot tube survey of wind stream with model propeller in operation, with special reference to distribution of velocity in the cylindrical shell outside the tip circle of the propeller.

(*c*) Comparison of thrust and torque coefficients for four sizes of propellers of successively increasing diameters.

The results of these three examinations may be briefly indicated.

The diameter of the wind stream was reduced by 6-inch steps by blanking over the delivery end of the collector with suitable flat annular rings. This had the effect of closing off an outer zone of cells of the honeycomb baffle, leaving the remainder operative. This gave wind

streams of diameters, successively, 66, 60, 54, and 48 inches, and within which a propeller of 3 feet diameter was run. The results were then reduced to the form of thrust and torque coefficients by assuming, at equal values of V/ND, a force variation with the square of the speed.

The torque and thrust coefficient curves thus derived give the following indications: The torque and thrust of the 3-foot model in wind streams of 5 feet and 5.5 feet in diameter are sensibly identical. For a wind stream 4.5 feet diameter the torque and thrust were about 2.5 per cent greater than for the wind streams of 5 feet or 5.5 feet diameter.

For a wind stream 4 feet diameter the torque and thrust were 6 to 7 per cent greater than for the wind streams of 5 feet or 5.5 feet diameter.

With the model propeller in operation and throwing aft a slip stream of pronounced velocity, the wind stream across the entire section forward of and about the propeller was subjected to survey by Pitot tube. The results indicated a relatively abrupt break in the influence of the propeller close about the tips of the blades, and that the size of the slip stream proper at and just in advance of the propeller was practically determined by the diameter swept by the tips of the blades. The velocities in the cylindrical ring lying outside the blade tips were also compared with the depression within the chamber and found to agree as previously stated. These tests indicate that the special influence of the propeller in disturbing the distribution of velocities through the wind stream extends to but a slight distance beyond the circle swept by the tips of the blades. The indications of this test, therefore, support fully the anticipated relation between diameter of propeller and of wind stream.

As a final test in regard to this important question, four propellers of diameters, successively, 30, 36, 42, and 48 inches, and similar geometrically, were tested out in regular course and the results reduced to thrust and torque coefficients by assuming, at equal values of V/ND, a force variation with the square of the speed and with the square of the diameter. The results of these tests are shown in figures 11 and 12 and indicate substantially the same values of the coefficients for the same value of V/ND for all four propellers. This indicates apparently that the diameter of the propellers might have been increased to 42 inches, or possibly even to 48 inches, and run in a wind stream of diameter 66 inches without sensible departure from the conditions in an indefinite stream.

As a matter of fact, as may be noted in the figures, the values of the coefficients for the diameters 30, 42, and 48 inches lie most satisfactorily on a continuous smooth curve. Those for the diameter 36 inches lie slightly above. This slight variation is apparently due to some slight departure in geometrical similarity between the propeller for 36-inch diameter and the other three.

In any event these results, together with the others noted above, seem to justify fully the use of the propeller models of 36 inches diameter in the wind stream of 66 inches diameter.

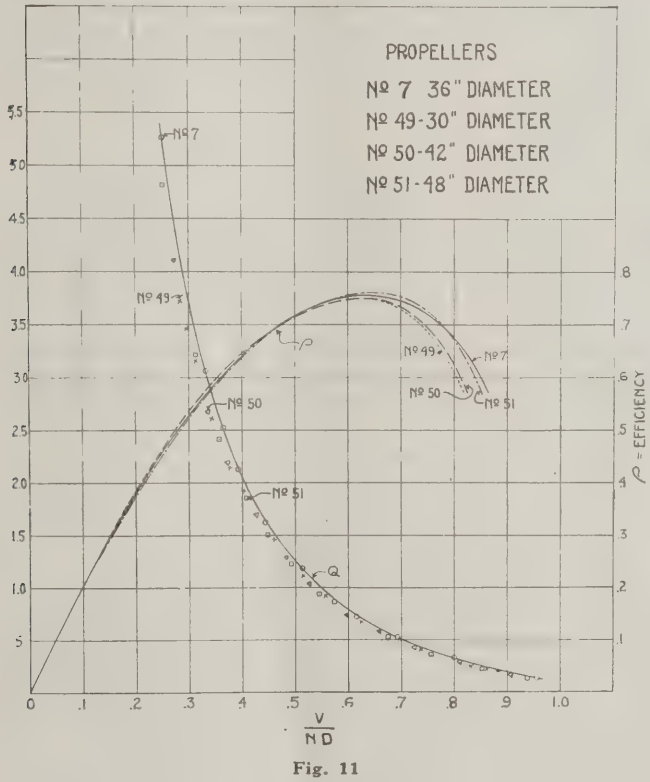


Fig. 11

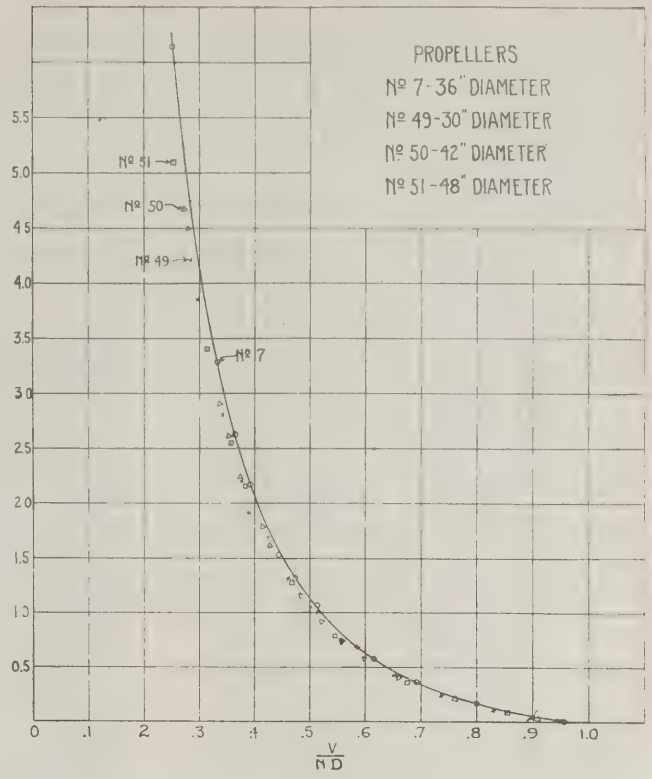


Fig. 12

Calibration of Torsion Dynamometer

The torsion dynamometer was calibrated as shown in figure 13. A Prony brake was attached to the shaft at the propeller position. A load was applied and the corresponding yield of the spring was noted. These tests were made at various speeds, and loads were applied varying from zero to the full capacity of the driving motor. These calibrations were conducted daily throughout the tests in order to detect any change in the ratio of spring yield to moment in pound-feet. The ratio was found to be practically constant for all speeds and loads.

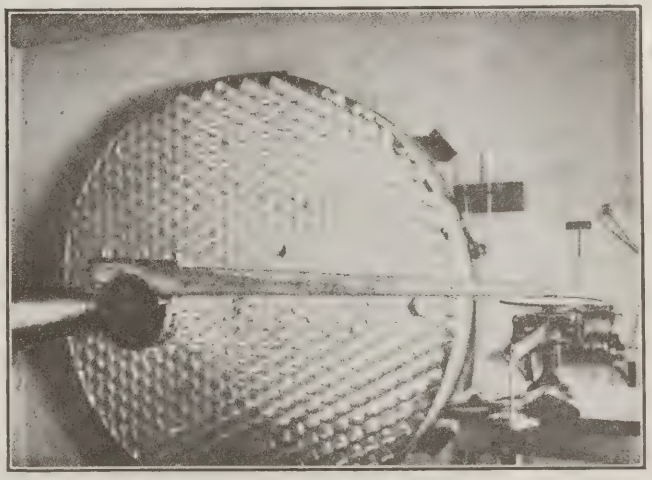


Fig. 13

British Work of Air Service Summarized in House of Commons

The great assistance which the air services, naval and military (now being combined under the Air Council), have rendered to the armies in the field was described in the House of Commons to-day by Major J. L. Baird, Parliamentary Secretary to the Air Board, when he introduced the estimates for that department. Last September 139 enemy machines, it was positively ascertained, were destroyed by British airmen, 13 were brought down by anti-aircraft guns and 122 were driven down out of control.

Through the direction of airmen in one day 127 hostile batteries, said Major Baird, were successfully "engaged to destruction"—meaning that the airmen reported that the batteries were silenced—28 gun pits were destroyed, 80 more were damaged and 60 explosions of munition dumps were reported. On the same day 34 hostile batteries were "engaged for destruction" as a result of balloon observations.

In September, 15,837 photographs were taken, and 7,886 bombs were dropped on various military points on the German lines.

There were eleven raids into Germany in the past two months, while the Germans succeeded in carrying out only eight into Great Britain, despite the fact that London was more easily reached than anything Germany could offer.

Thirty-five German warplanes have been destroyed in the days of February 19, 20, and 21, and nineteen driven down out of control—a total of fifty-four enemy machines.

Hydroaeroplanes Sink Submarine

An encounter between two French hydroaeroplanes and a German submarine in the English Channel recently probably resulted in the sinking of the U-boat after it had been bombed by the planes, according to an official announcement by the French admiralty.

The aeroplanes were on patrol duty over the Channel when they discovered the submarine on the surface. They attacked it, after manœuvring so that the sun was at their backs, and the submarine plunged, but it did not disappear before the aviators had succeeded in dropping several bombs on or near the periscope.

While one aeroplane returned to the base for more bombs, the other kept watch and saw the submarine emerge after a few seconds with a list to port of 45 degrees. After attempting to right itself, the submarine again disappeared, only to reappear a third time. Its instability, however, increased, and suddenly the observer saw the submarine list still further and sink, so that even the periscope could not be seen.

METEOROLOGY: THUNDERSTORMS

By PROFESSOR W. G. DUFFIELD, D. Sc.

THERE can be no doubt that lightning is a form of electrical discharge of exactly the same nature as that which takes place between the terminals of an electrical machine, though on a scale of immense grandeur.

By sending up a kite on a stormy day Franklin found that an electric current flowed down the wet string, and that sparks could be drawn from the end of it which differed in no respect from those which he was able to produce in his laboratory. The electric currents derived from the clouds cause the same heating and chemical effects as currents from an ordinary battery, and no one has ever found any reason for doubting the identity of atmospheric and terrestrial electricity. Experiments with kites are notoriously dangerous on account of the current which may run down the cable; a spark nine feet long was once obtained from the winding gear, and on more than one occasion the observer has been killed by a sudden discharge.

In a previous article we have discussed the most recent theory designed to account for the production of an electrified cloud. It remains to say a word about the form which the lightning may take. When a spark snaps across the gap between the terminals of a powerful electrical machine it is noticed that the spark is not a straight line of light, but a very irregular track with numerous branches, which when photographed present the appearance of tributaries to a great stream flowing towards one of the terminals. In nearly all cases lightning is of this nature—the vivid flash leaves an impression of a zig-zag line of light wtih many ramifications, which sometimes have the appearance of prongs depending from a gigantic handle, an impression which probably accounts for the popular term "forked lightning," which is given to this manifestation of atmospheric energy. The crookedness of the flash is caused by its choice of the path of least resistance, some parts of the atmosphere conducting electricity better than the rest.

When lightning occurs at a great distance it may happen that the flash is below the horizon and is not itself visible, though the light from it may illuminate a near bank of clouds and be reflected to the onlooker. He then sees what is known as "sheet lightning," just a general diffused brightening of a particular patch of sky. The same appearance is to be observed where a flash of forked lightning takes place behind a bank of clouds.

Sailors sometimes record an unusual phenomenon which appears as a luminous tuft or ball, which seems poised on the top of a mast. There can be no doubt as to the reality of this remarkable occurrence, and it is capable of a simple explanation. Anyone who has turned the handle of an electrical machine in a darkened room will have noticed that from all the points and sharp edges of the metallic parts there is a faint glow of bluish-white light, which, if examined closely, looks like a luminous brush or tuft. It is called a brush discharge, and it illustrates the readiness with which a point dissipates an electric charge, especially if it is a negative one. The ship is charged electrically by virtue of its proximity to an electrified cloud, and this charge is given off from the pointed parts, of which the mast is naturally the most prominent feature. It is the brush discharge at the top of the mast which gives rise to the curious electrical display which we have mentioned, and which is commonly known as St. Elmo's fire.

It remains to make one point clear, and that is the manner in which a ship at sea, or anything upon the earth's surface, may be charged with electricity by the proximity of an electrified cloud above it. This involves a matter which lies at the basis of the use of lightning conductors to protect a building from destruction during a thunderstorm.

A simple experiment will show the kind of action that takes place. Hold an electrified rod, for example a stick of sealing wax, which has been charged negatively by rubbing it upon a coat-sleeve, close to a lump of metal or any other conductor which has been suspended by a silk thread or supported by some insulating material (Fig. 2). It will be found that each end of the metal, which was uncharged before the electrified rod was brought close up to it, has now the property of attracting to it small pieces of paper, and that it has become charged with electricity. Further examination would show that the electricity thus induced is of two kinds, positive at the end close to the sealing wax, which is itself negative, and negative at the farther end.

The same thing happens when a cloud charged with electricity hovers over the countryside. The earth below it becomes charged with electricity of the opposite kind. A ship at sea is similarly affected, but, as we have seen, it may dissipate its charge from the point of a mast in the form of a soft feathery glow.



Fig. 1.—A typical electrical discharge showing its forked nature.

This explains the use of a lightning conductor. Whenever a thundercloud gathers there is imminent danger of a discharge taking place between it and any tall object on the ground, but if a number of pointed conductors are erected on this object there will always be a continuous and silent discharge from the points of a kind of electricity opposite to that in the cloud. For example, suppose that a cloud charged with positive electricity passes over a church tower (Fig. 3), the electricity which is induced in the church is the negative kind, and if the tower is provided with a point this negative electricity will be discharged into the air, where it will tend to neutralize the electrification of the thundercloud and render it less dangerous. The larger the number of points and the wider their distribution the more rapidly is the cloud's electricity rendered ineffective. A community should encourage the individual houses to fix pointed lightning conductors, as this affords a greater measure of safety to the whole, but it is a little doubtful whether an isolated house in an exposed position gains or loses by the provision of a lightning conductor. A single point cannot hope to dissipate enough electricity to neutralize the whole of a great thundercloud, and it may act in the opposite way to that for which it was intended by presenting a line of small resistance to the discharge. But even in this case, if well laid and if insulated from the walls with its end well buried in the earth, it is probably advantageous to employ it.

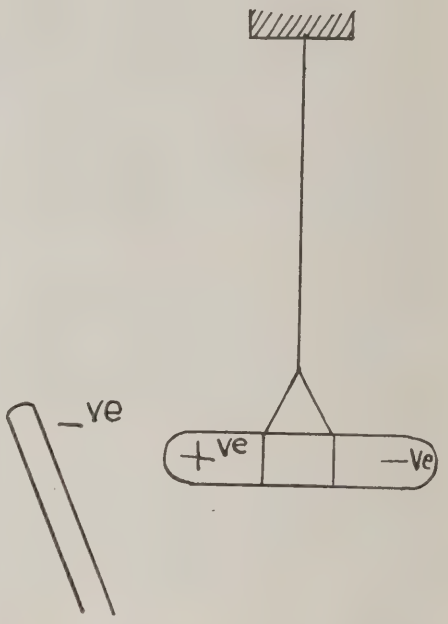


Fig. 2.—The negatively electrified rod held near the metal conductor, which was originally uncharged, induces electrical charges upon it. A charge of the opposite kind being nearest the rod.

An interesting suggestion for protecting a house from the danger of lightning was made by Maxwell, who had in mind a famous experiment carried out by Faraday—the London lad born in Newington Butts whose youth was spent in a mews off Manchester Square, but whose genius raised him to the greatest eminence which a scientist can hope to attain, and whose brilliant discoveries have illuminated the researches of a century. This great man had been led to believe that, no matter how large an electric charge was imparted to a conductor, there would be no force within it. He therefore constructed a metallic chamber, into which he retired, while his assistants outside charged it to the greatest possible extent and could draw sparks from the exterior. Faraday observed that though he had provided himself with the most delicate electrical apparatus, he could not detect the slightest trace of any electrical action inside.

The proposal that each house should be urnished with a network of wires which would render its interior free from electrical influences is the natural outcome of this experiment.

Some light upon the shattering effect of a flash of lightning upon a structure which stands in its path is afforded by holding a piece of cardboard between the terminals of a powerful electrical machine or induction coil. The card is found to be pierced, and if examined with a magnifying glass a burr will be found on each side of the card, as though the whole had in each case been pierced from the centre outwards, very much the condition which would be observed if an explosion had taken place within it.

The fusing of metal pipes and bell wires which sometimes results from a flash of lightning, is due to the huge electrical current which they are momentarily called upon to bear, and they are the result of the heating which is always experienced when a strong current passes along a wire whose electrical resistance is considerable.

Production of Ozone

A question of some interest is the production of ozone by a discharge in the atmosphere; there is sometimes a faint characteristic smell after a thunderstorm, which is due partly to this gas. The electrical current seems to have a disturbing effect upon the nitrogen and oxygen, which are the chief constituents of the air, causing a rearrangement of the atoms which compose them; some atoms, which usually go about in pairs, when they form oxygen, going about in groups of three under the influ-

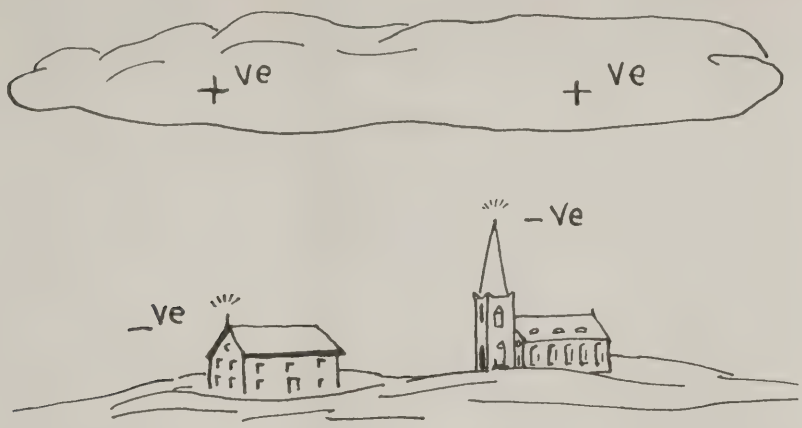


Fig. 3.—A thundercloud which is positively charged induces a negative charge on the ground below it. This is dissipated by the points on the buildings into the air where it neutralizes some of the electricity in the cloud.

ence of the discharge when they form ozone. Other nitrogen and oxygen atoms combine to form an oxide of nitrogen.

There has for a long time been a popular belief that the electricity in the air during a thunderstorm turns milk sour. Working in close proximity to a dairy, in which this idea was firmly rooted, Mr. S. A. Murray and the writer undertook some experiments in which an electric discharge was produced between metal points, and the electrified air from the neighborhood of the spark blown through a sample of milk; the milk thus treated was analyzed at various intervals of time afterwards in order that its sourness might be determined. Careful control tests were made with untreated milk, and the curious fact emerged that this artificial thunderstorm, far from hastening the souring, retarded it, and was found possible to keep the treated milk for five days quite sweet, long after the untreated milk had turned completely sour. Though it was not claimed that the spark discharge accurately reproduced the conditions of a thunderstorm, it is interesting to note that, as far as the evidence went, it was against the popular belief being correct. It seems probable that when milk is turned sour during a thunderstorm it is on account of the warm, sultry conditions which frequently prevail, rather than on account of the electrical state of the atmosphere.

We can distinguish roughly between two types of weather which are favorable for the development of thunderstorms. The first is the squally type, which generally affects the country when a depression or region of low pressure is passing over it. The advent of this is preceded by a falling barometer, and the storm comes up with turbulent clouds and with wind and squalls of rain. It is when the barometer has reached its lowest point that thunder and lightning are most likely to occur.

The other type is the quiet weather which is sometimes experienced when the barometer is almost stationary and when there is very little wind moving. On a hot, sultry day vertical currents of great intensity may develop and produce towering masses of clouds which, as we have seen, may become centres of terrific electrical energy.

Indicator Shows Condition of Aero Motor in Flight

An indicator has been developed for the purpose of showing to the aviator his exact motor temperatures at all times. Its construction is such that the indicator may be placed on the instrument board in the cockpit of an aeroplane, under the aviator's eye. It serves as a constant assurance that his motor is running normally and warns him against overheating of his engine, due to any one of a number of well-known causes, such as poor lubrication, failure of his water pump, leakage or boiling away.

The instrument complete, ready for installation, consists of a seamless bronze bulb which screws into the outlet pipe of the water manifold as near as possible to the last cylinder. A ground joint on the coupling at this point eliminates all packing and insures against leaks from excessive vibration.

From this bulb a fine capillary tube of bronze, rolled to a special cross section of extremely small volume, leads back to the helical tube within the case. This capillary is protected by a copper tube of larger size. Within the case of the instrument the capillary is connected with a long spiral tube of very small volume, the uncoiling or coiling of which actuates the spindle on which the pointer is mounted, through a spiral temperature compensator.

The motion of this helical tube is long enough to allow the pointer to cover the whole range of the dial, from boiling to freezing. The long motion of the actuating spiral eliminates the necessity of using any multiplying gears or levers within the case, and makes possible an instrument of the direct drive type. The actuating fluid within the instrument is alcohol.

The system is pumped out and completely filled with alcohol under considerable pressure. The expansion of the liquid in the bulb actuates the instrument at the end of the capillary. As the volume of the connecting capillary is extremely small in relation to the bulb volume, the errors in reading caused by extremes of temperature to which the tube is subjected are not readable.

The temperature compensator within the case corrects for extremes of temperature to which the instrument itself may be subjected. This type of indicator is absolutely unaffected in its readings by differences in altitude. The needle remains steady under the most severe conditions of vibration.

Instruments are made with Fahrenheit or Centigrade scales, and indicate the temperature of boiling water at all altitudes up to 20,000 feet.

This device is being manufactured by the Moto-Meter Co., Long Island City, N. Y.

Germany Claims Destruction of 151 Allied Planes

A summary of allied aeroplanes destroyed during the month of January was made in the announcement of February 15th. This statement says:

"During January the enemy lost on the German front twenty captive balloons and also 151 aeroplanes, 67 of which fell behind our lines. The remainder were seen to fall within the enemy's positions. In aerial fighting we lost 63 aeroplanes and four captive balloons."

Ford Motor to Make Complete Liberty Engines

The Ford Motor Co., Detroit, will be the largest single producer of Liberty aeroplane engines. Although the company has been producing only cylinders, under a new program, the engines will be made complete. The Ford Company has so perfected the process of manufacturing cylinders that a saving of from 40 to 50 per cent in their cost has become possible. According to its contract with the government, the Ford Company is entitled to but 25 per cent of the saving, the remainder going to the Government.

It is understood that the Ford Company will commence the production of complete engines this month. Already the Packard Company is in production on the twelve cylinder types. It is expected that the Nordyke & Marmon Co., Indianapolis, and the various General Motors Co. divisions will be in production in from 30 to 60 days.

Marconi Favors Allied Consulting Board

In an interview with Edward Marshall, Guglielmo Marconi, the inventor of wireless telegraphy, gave his views on the formation of an an allied consulting board, based on the U. S. Naval Consulting Board, of which Thomas A. Edison is the chairman. He believes that such a board would be of immense value in all phases of warfare and assist materially in assuring the quick adoption of inventions that might prove of value in military operations. Marconi is quoted as follows:

"Perhaps most important of all the work the board might do would deal with aviation. It has been developed wonderfully. There are good men who believe that if it were developed to its immediate ultimate efficiency it might be the war's decisive factor. In it we have made some advance, but it would be perhaps too much to say that we have traveled further, faster, in our general air progress than our enemies have traveled. We ought to. We could if we intelligently organized and used a board of this sort.

"There are many other things which would gain greatly from the work of such a board. Everything would gain. A board of this sort easily might be the power to hasten victory or even to make victory decisive. Not a moment should be lost in organizing it."

Son of Major-General March Fatally Hurt in Flying

Second Lieut. Peyton C. March, Jr., son of Maj. Gen. Peyton C. March, who has been called from France to be Acting Chief of Staff, sustained a fracture of the skull when his aeroplane fell at Taliaferro Field. He is said to have small chance of recovery.

He was a student at Lafayette College, at Easton, Pa., when the war started. Being too young to join any branch of the military service, he became a member of a hospital unit at Allentown, Pa., and later, when his age permitted, he joined the aero service.

Aeroplane Cause Destruction of Goeben

The sequel to the British naval victory in the Dardenelles which resulted in the loss of the light-cruiser Breslau, which had been purchased by Turkey from Germany, was a victory for aeroplanes which resulted in damage to the cruiser Goeben.

According to the announcement following the battle, the utter fearlessness with which two British torpedo boats attacked the two cruisers and their four destroyer convoys and sent them into percipitate flight after they had sunk two British monitors upholds the best traditions of the British Navy.

On seeing the Breslau sunk, the Goeben turned and circled on a southerly course. Immediately after this four enemy destroyers were sighted coming out of the Dardanelles, supported by an old Turkish cruiser. The two British cruisers drove off this force. The Goeben continued a southerly course, until an attack by British aircraft forced her to alter her course and head for the Dardanelles. In the act of turning, she struck a mine, which caused her to settle down aft with a list of ten to fifteen degrees, which considerably reduced her speed. She proceeded slowly up the Dardanelles, escorted by enemy seaplanes and destroyers.

British aircraft attacked repeatedly and obtained two direct hits when the Goeben was off Chanak. The Goeben was then in such a damaged condition that she steered for the shore and beached at the end of Nagara.

Shortly after she was beached, two more direct hits were made on her by British aircraft, who were engaged by enemy seaplanes. In the encounters which took place, one of the British seaplanes failed to return.

An official report, under date of January 23, reports continued aerial bombing of the Goeben, as follows:

"Naval air service machines have made several day and night attacks on the Goeben and secured two hits with heavy bombs. They have also bombed one of the tugs which is secured alongside the Goeben. In every case heavy anti-aircraft gunfire was encountered, but all our machines returned safely.

"The attacks are continuing."

FOREIGN NEWS

FRANCE

Extensive air raids and bombing attacks are described in the official communication from Paris on February 15th, as follows:

"On the night of February 12-13 French aerial squadrons dropped 4,500 kilograms of projectiles on the railroad stations at Thionville, Conflans, Schemblez, Metz and Sablons. Fires and explosions were observed at the stations at Schembletz, Metz and Sablons."

The Germans again raided Nancy, according to the official communication of February 16th, described as follows:

"Enemy aviators last night dropped several bombs in the region north of Nancy. It is reported that civilians were killed or wounded."

Numerous extensive bombing raids, with very successful results, are reported on February 18th. Thirteen thousand kilos of bombs were dropped. The official description of the operations are quoted in full:

"Two German aeroplanes were brought down by our special guns. Our bombing aeroplanes carried out various expeditions against the railway stations at Thiaucourt, Thionville, Metz-Sablons and Pagny-sur-Moselle, enemy establishments at Hirson and divers aviation grounds, upon all of which numerous projectiles were dropped. Thirteen thousand kilos of explosives were dropped, causing several fires and explosions in bombed buildings."

The good work of the previous night was followed by an even more active series of bombing operations over German territory, officially described on February 19th sa follows:

"On February 16, 17, and 18 our pilot brought down seriously damaged in numerous combats eighteen German machines. In addition, an enemy captive balloon was burned.

"On February 18, in the day and night, our bombing escadrille dropped 16,000 kilos of explosives on enemy objectives, notably on the stations of Metz-Sablons, Forbach, and Rensdorf, on depots at Ensisheim (south of Colmar), where a violent fire broke out, and on various aviation grounds."

The destruction of five enemy aeroplanes is reported in the official communication of February 21.

GERMANY

Germany took advantage of the favorable weather conditions and dropped bombs "extensively" and reports the destruction of sixteen allied areoplanes and two captive balloons in the announcement of February 18th, as follows:

"In clear, frosty weather the aerial activity was very lively throughout the day and night. Bombs were dropped extensively on military construction works behind the enemy's front, and one aeroplane attacked London. In the last two days sixteen enemy aeroplanes and two captive balloons have been brought down in aerial fighting and by gunfire."

On February 19th the German War Office announced that seven enemy aeroplanes had been brought down in aerial fighting on the previous day.

A raid by Entente aviators on Treves, Rhenish Prussia, is reported in a despatch from that city to the Cologne Gazette. It says bombs were dropped in various parts of Treves, causing damage to property. No military establishments were injured. Treves is a city of about 35,000 inhabitants on the Moselle River, thirty-five miles from the French border.

GREAT BRITAIN

The night report of February 17th reports the destruction of 17 enemy aeroplanes and the dropping of hundreds of bombs on the German lines. The official description follows:

"Over five tons of bombs were dropped on various targets. There was much air fighting. Fourteen German machines were brought down and seven others were disabled, while British anti-aircraft guns shot down two other machines, one of which, a large bombing machine, fell inside the British lines. Its four occupants were taken prisoner.

"Another German aeroplane, making the seventeenth accounted for during the day, in addition to those disabled, landed near a British airdrome. Its occupants were captured. Five British machines are missing.

"During the night of Saturday-Sunday our machines dropped 400 bombs on hostile aerodromes in the neighborhood of Ghent, Tournai and Laon. The railway station and sidings at Conflans also were successfully bombed. All our machines returned."

Another day of very extensive and successful aerial operations is described in the official announcement of February 18th against railroads and industrial centers. The announcement is quoted in full:

"There was fine weather Sunday, and the incessant bombing that had been in progress for thirty-six hours continued. More than six tons of bombs were dropped on various targets and aerodromes in the neighborhood of Tournai, Lille, and Courtrai.

"Again there was severe air fighting, enemy scouts making determined but unsuccessful attacks against our bombing machines. Ten hostile machines were downed and six others were disabled. Three of our machines are missing. Sunday night there were further bombing raids on Conflams. A ton of bombs was dropped on the railway. Several burst and a fire was started. All our machines returned.

"To-day our bombing squadrons raided by daylight the barracks and railway station at Treves and the steel works and railway station at Thionville, with excellent results. All the machines returned safely."

On February 19th the British War Office issued a statement reporting another day of extensive aeronautic activity, with further damaging results on enemy territory. The statement says:

"Air fighting was continuous on Monday, resulting in eleven hostile machines being brought down and six others driven down out of control. Two of our machines are missing.

"Our night flying squadrons after dark again attacked Trèves and Thionville from a low height with good results. In a second raid on Thionville a large fire was started. One of our machines failed to return.

"On Tuesday another raid was made in broad daylight, making the third within thirty-six hours carried out against Trèves. Over a ton of bombs were dropped on the obectives. Three good fires were started. One of our machines is so far unaccounted for."

The work of the British Naval Air Service against submarine bases continues with relentless energy, and one of the numerous bombing exploits has been described in an official announcement of February 19th, as follows:

"On Sunday night our naval aircraft dropped several tons of explosives on the Zeebrugge mole and docks and on the Bruges docks. Bombs fell alongside the submarine shelter and near the lock gates and quays.

"Yesterday several direct hits were obtained on hangars at the Varssenaere aerodrome. Three enemy aircraft were destroyed during offensive patrols. All our machines returned."

The announcement of February 20th reports the destruction of thirteen enemy aeroplanes and successful bombing expeditions, as follows:

"In air fighting Tuesday eleven hostile machines were brought down and another driven down out of control. At night a bombing machine was brought down in No Man's Land by infantry. Two of our machines are missing.

"Tuesday night Thionville again was attacked successfully. Twenty-six heavy bombs were dropped on the railway station and a large explosion was caused by two fires started. All our machines returned safely. To-day our aeroplanes bombed large factories and the station at Pirmasens, in Germany, and dropped a ton of bombs. All returned safely."

The Royal Naval Air Service continued its aerial offensive and downed several enemy planes. The announcement of February 20th reports the following:

"Naval aircraft dropped many tons of explosives Monday night on St. Denis Westrem and the docks at Bruges and drove down an enemy machine. Large quantities of explosives were dropped Tuesday on the airdrome at Aertrycke and the dump at Engel, with good results. An enemy seaplane was brought down at sea, another was downed within the British lines, and a third was sent down out of control."

The Germans conducted an air raid against London on the night of February 16th. The text of the official statement describing the raid reads:

"About six enemy aeroplanes approached the mouth of the Thames about a quarter to 10 o'clock last night and carried out an attack against London. All were turned back save one machine, which penetrated the capital along the line of the river and dropped a single bomb in the southwest district about 10 o'clock.

"This bomb demolished a house and buried an invalid officer and his wife and two children. Several other bombs were dropped by the raider in the eastern outskirts on its way in, but no serious casualties or damages have been reported.

"An attack which was delivered against Dover about 10:45 o'clock was driven off, some bombs being dropped in the open country.

"Several of our pilots engaged the enemy. One of them fought an action over the Kent coast, and shortly afterward a large enemy machine was seen from the shore to crash into the sea. Police reports of the casualties and damages have not yet been recieved, but apparently they were light."

The official report on Saturday night's casualties reads:

"The total casualties caused by the aeroplane raid Saturday night were: Killed, three men, five women and three children; injured, one man and three children."

On the following night (February 17th) another raid occurred.

The official statement on Sunday night's raid follows:

"Sunday night's air raid appears to have been carried out by six or seven enemy aeroplanes, of which only one penetrated into London. The first raider passed the Isle of Thanet at about 9:45 P. M. and proceeded up the Thames estuary into London, crossing the capital from southeast to northwest. Bombs were dropped in various districts between 10:40 and 10:55 o'clock.

"The remaining raiders, which attempted to reach London from the northeast across Essex or from the east along the line of the River Thames, were all turned back.

"The casualties were:

"Killed—Men, 13; women, 3. Total, 16. Injured—Men, 27; women, 10. Total, 37."

Hostile aeroplanes attempted a raid against London on February 18th, making the third raid in as many nights. An official statement says:

"Hostile aircraft crossed the coast shortly after 9 o'click to-night and proceeded toward London. None of the raiders penetrated the defences, and so far there has been no damage and no casualties."

In the raids of Saturady and Sunday nights twenty-seven persons were killed and forty-one injured.

ITALY

The Italian official announcement of February 20th describes various successful bombing raids as follows:

"Aerial activity on both sides was marked along the front lines. At dawn a squadron of British machines surprised the aviation ground at Casarasa and bombed it with very good effect. An airship shed was destroyed.

"At night one of our squadrons reached the aviation camp at La Comina and dropped two tons of explosives, causing a large fire. All of our machines and those of the Allies returned without damage.

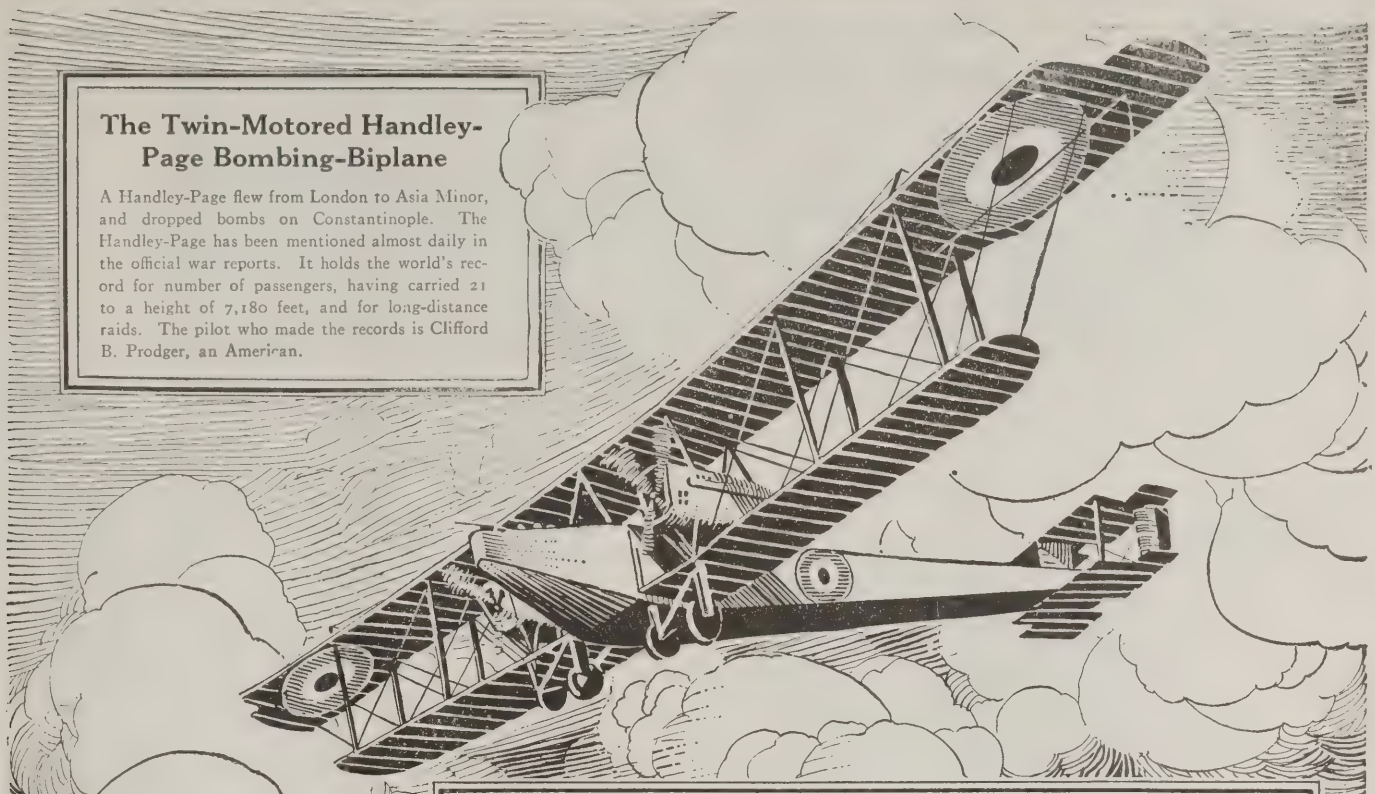
"Last evening an enemy aeroplane returning from a bombing expeedition was brought down north of Treviso."

Reporting on aerial activity on February 21st, the Italian official announcement says:

"The Italian and British aeroplanes attacked efficaciously the enemy's aviation camps near La Comina, Aviano, Visnadello and Motta di Livenza. Over the last place one navy hydroplane dropped two tons of high explosive bombs. All returned undamaged.

"Last night eight enemy aeroplanes flew over cities behind our line, causing considerable damage. Padova was bombarded three times, numerous bombs were dropped over Vicenza, Mestre, Venice and Trebaseleghe, northwest of Mestre. Fortunately we have to deplore only a few victims among civilians, most of them being women. Anti-aircraft batteries met the enemy with intense fire. One machine struck came down in flames near Volpago.

"Yeesterday morning one of our aerial squadrons bombarded the railway station at Innisbruck."



The Twin-Motored Handley-Page Bombing-Biplane

A Handley-Page flew from London to Asia Minor, and dropped bombs on Constantinople. The Handley-Page has been mentioned almost daily in the official war reports. It holds the world's record for number of passengers, having carried 21 to a height of 7,180 feet, and for long-distance raids. The pilot who made the records is Clifford B. Prodger, an American.

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Valspar has successfully fulfilled the most severe requirements of the most arduous war-service. It stands supreme as the most reliable airplane varnish for wood, metal, or fabric.

We have made a close study of airplane and seaplane requirements, and our Airplane Service Department is ready to give the benefit of its experience to any manufacturer. A valuable handbook on this subject will be sent to Purchasing Agents or Superintendents of Production, on receipt of name.

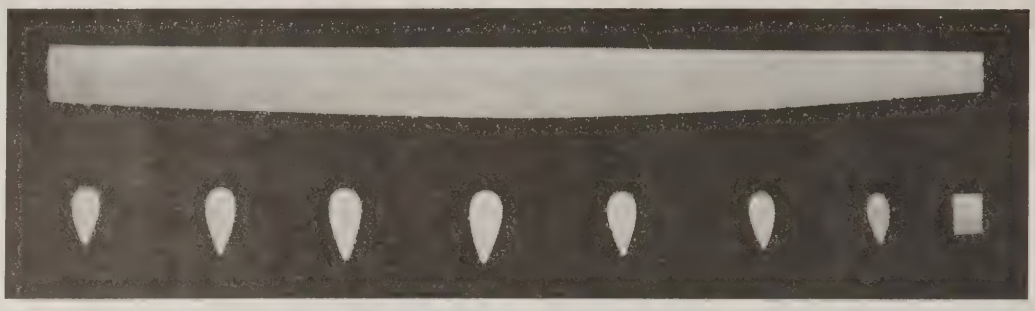
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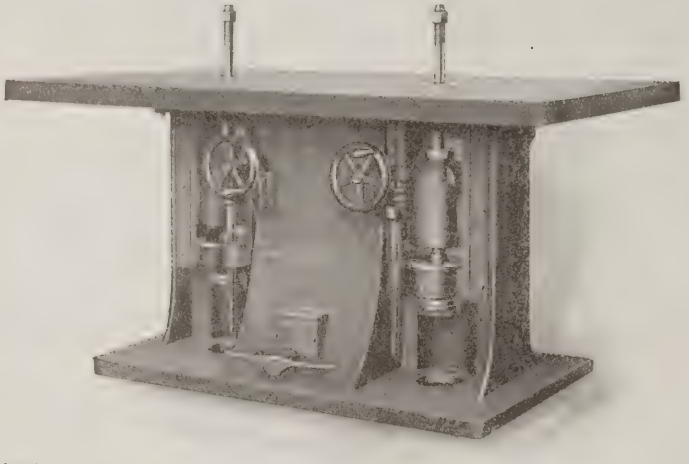
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No trick to do it

Do you want to know how?

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Military Aircraft and Their Armament

(*Continued from page* 1115)

far as possible, remaining in the line of fire of the attacking machine; it is thus that the pilot of the chasing machine can make his skill tell.

The necessary correction is obtained by special sighting apparatus, being automatically deduced according to the angle under which the enemy aeroplane is seen by the gunner. These highly interesting "sights" must not at present be described.

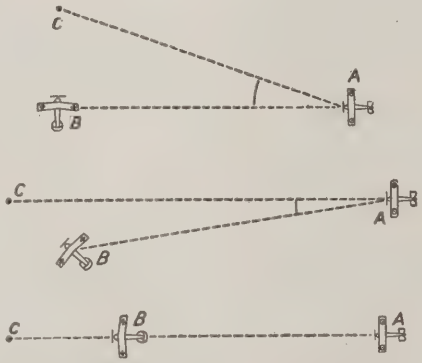
The above formulas are those in use on the majority of the French and of the enemy's aeroplanes. But there exist certain other formulas in use on trial machines, or on some rare specimens which are destined to disappear. The great tendency is to provide identical characteristics for aeroplanes having the same mission. Witness the table below:

Chasers

Two hundred h.p. motor; one place biplane having 25 square meters of surface; two machine guns firing through the propeller (Series D).

Artillery, Photography, Bombardment

Two hundred and twenty h.p. and 260 h.p., single motor two-seaters of 40 square meters; one machine gun firing through the propeller; one upon the tourelle. (Series C.)



Figs. 14, 15, 16.—The direction of the fire, taking into account the relative displacement of the enemy

Protection and Bombardment

Five hundred to 550 h.p. two-motor, three-seater of 100 square meters;
1 machine gun forward on a tourelle.
1 machine gun at the rear on a tourelle.
1 machine gun underneath on a pivot. (Series G).

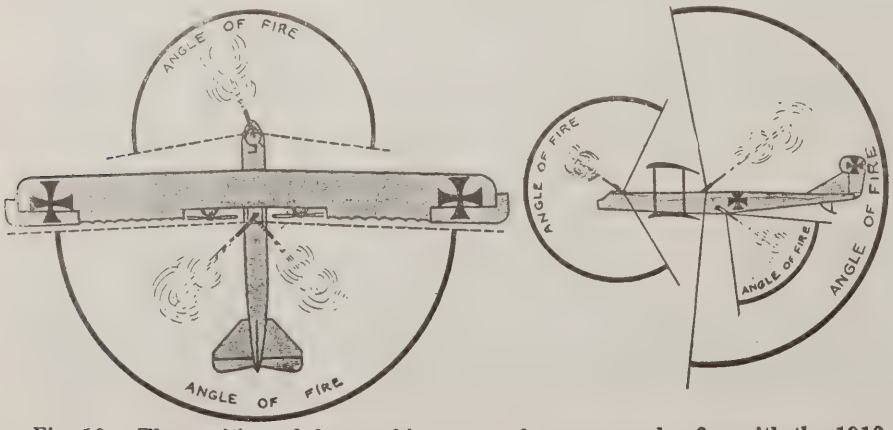


Fig. 13.—The position of the machine guns, the zones under fire with the 1916-1917 Gotha

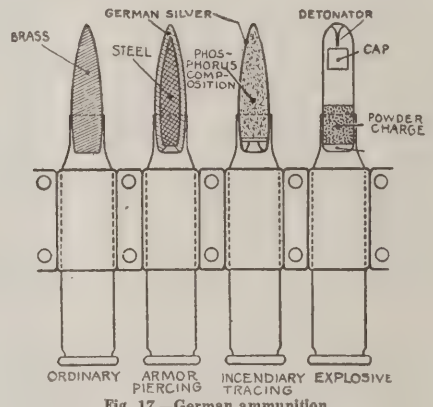


Fig. 17.—German ammunition

The munitions employed by the Germans at present are the following: ordinary bullets, incendiary, perforating and explosive balls (Fig. 17). The difficulties encountered by our enemies in manufacturing munitions so highly specialized force them to use ordinary bullets in the majority of cases.

The incendiary and tracing balls are hollow and contain a combustible substance with a phosphorus base. They leave behind them a luminous trail and are designed both to set fire to balloons and gasoline tanks and to enable the gunner to rectify his fire.

The perforating balls are composed of a core of hard steel enclosed in an envelope of German silver. They are designed to pierce metal portions, especially motors. Other balls are explosive, the belts and drums, containing 10 to 15 per cent of these. They have the form and the composition of a small shell; a small plate forming an exploder over a capsule and detonating substance.

All these specialized balls have trajectories which differ perceptibly from these of ordinary balls, a difference caused by their shape and weight.

In combat taking place at a distance of less than 300 meters (975 feet) it is not necessary to employ special sights.

The bitterness of air fighting increases daily; it is vital for us to obtain absolute mastery of the air. The aeroplane has shown itself too powerful a weapon for us to allow our enemies to balance us in its possession.

Thomas

THOMAS-MORSE AIRCRAFT CORPORATION

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Contractors to U.S. Government

U. S. Government Wants Speedy Delivery on War Contracts

An indication that the United States Government has come to the conclusion that the surest and quickest way to win this war is through the air, is evidenced by the great number of war contracts which have been placed recently with the large manufacturers of aeroplanes.

One of the greatest factors turning out these war orders on contract time is that of quick and reliable transportation facilities. On account of its length and bulkiness, aeroplane material has proven to be quite difficult to transport quickly without sacrificing some degree of safety to the matter hauled.

The type of installation pictured above has been selected by the Standard Aero Corporation of New Jersey, to meet their delivery requirements. This is a two ton MACK chassis, with an extra long wheel-base of 200 inches and capable of efficiently carrying lengths up to 25 feet. Material of this length, such as aeroplane wings, assembled fusilages, etc., can be carried with a small overhang of only five feet, when loaded on this truck. This small overhang prevents the dangerous "whip" of the tail-end which is such a menace in heavy traffic. This extra length platform also supports the material carried through nearly its entire length, thus eliminating the stress that would ordinarily be placed on long, flexible material that would be obliged to droop over the edge of the truck for a length of ten or fifteen feet.

This truck equipment has been designed with all these things in mind, and it is believed that the solution of the quick, reliable and safe delivery of material of this nature has been satisfactorily solved.

It is needless to say, however, that this type of body is also adaptable to other lines of business, such as the transportation of long ladders for the painter; unwieldy lengths of piping for the hardware concern, or plumber; or the carting of such long, light materials as stage scenery, etc., from place to place.

Lieutenant Pollock in the United States

Lieutenant Granville A. Pollock recently arrived in the United States, after rendering distinguished service in the Lafayette Escadrille.

Lieutenant Pollack, whose home is in New Orleans, La., was among the first to enter the aviation service. He went to France in August, 1914, and joined the Royal Marine Anti-Aircraft Corps, serving twelve months. During the first six months he saw service in Neufchatel, Ypres, and a number of other battlefields. For his work in Flanders he holds the Croix de Guerre. In November of last year he was in the offensive at the Aisne.

With the arrival of Kitchener's army his unit was broken up and he went to Paris and enlisted in the Foreign Legion, in connection with the Lafayette Escadrille. During July of last year he was assigned to the French army in Flanders and remained there in defensive service until the middle of last September.

Lieutenant Pollack received his instruction at various schools in France, the Buc, Paul Avord, Combat School at Paul, Perfect School at Plessis, and the Belleville Spad. He is now here on a short leave and is to report in Washington, D. C., for service with the American flying forces, having already received his commission.

A Notable Birthday

From a business in whale oil of a few thousand dollars yearly, 65 years ago, to a business in scientific lubricants which runs into the millions, is the enviable record of the Swan & Finch Company, which has just celebrated its 65th birthday.

The Swan & Finch Company is one of the oldest and largest manufacturers of special oils and greases in the United States. Its business was started way back in February, 1853, in a small building at 44 Water Street, New York City. It has grown, until to-day the main plant of the company, at Bayway, New Jersey, covers over 15 acres, with piers at which tank boats and even ocean-going steamers dock.

The original business of the company was in the sale of illuminating oils and lubricants such as were used in 1853, consisting of fish and animal oils, sperm and other whale oils, sea elephant oils, black fish and lard oils.

The company was among the first to refine menhaden fish oil, one of the products of its own fishing fleet, and is still the largest concern in the world in this line of business.

When the use of refined petroleum for lubricating purposes was discovered, this concern was one of the first to market mineral oils as lubricants, and to manufacture lubricating greases with a mineral oil content.

The company was the first to build up a world-wide business in oils for the lubrication of marine engines, and the Atlas trade-mark, one of the oldest oil trade-marks in existence, took its name, in fact, from the old Atlas line of steamers, to which it sold the first of its products.

Its various special products, developed for special purposes, have been placed on the market through its various branch offices, agencies and jobbers, under the old Atlas trade-mark, and latterly, each with its own separate tradename.

Slo-Flo, for instance, a special product developed for textile mill machinery, has been found highly valuable for many other uses. It is particularly adapted for use as a lubricant in textile machinery, for roller bearings, line shafting, electric motors, printing machinery, and other special purposes where a slow-flowing lubricant is required.

Cupese is the general name of a line of high quality cup greases.

Gearese, a lubricant for motor car transmissions and differentials.

Textul, an oil product for wool and worsted manufacturing purposes.

Aerul, an oil for aeroplane motors, which has been adopted by no less than 3 of the Allied Governments.

Motul, a motor oil for automobile cylinder lubrication.

Asbestese, an asbestos and wool-mixed grease combination for railway car journals.

Corul, a combination of oils for core making in malleable and gray iron casting work.

Marinul, for marine engines.

Talese, an economical grease for drop forge die-swabbing.

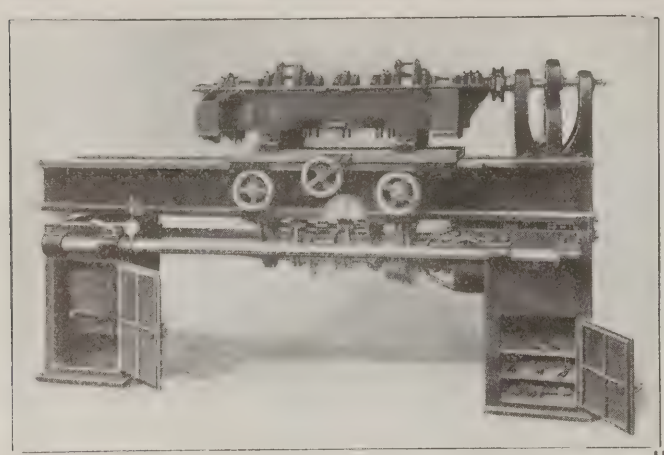
All of these products have been developed to meet certain specific requirements, necessitated by the advances in science and manufacture.

It can probably be said that the entire development of the company has come from the "service idea" in the effort to develop for its customers, special products definitely suited to the peculiar needs of each. The company now maintains a corps of chemists and field engineers whose duty it is to analyze the needs of each of its customers, and supply from its store of information the special product required, and where necessary to develop new products to meet new needs.

This sounds like a pretty big problem, and it is, for the Swan & Finch Company manufactures 197 separate and distinct oils and greases, covering a wide range of mechanical uses, from the lubrication of aeroplanes, to the manufacture of foundry casting cords.

The company has classified 103 industries, in which one or more of its oils are used, and no one of these industries thinks in just the same terms, or is faced by just the same conditions as any other.

Altogether, the Swan & Finch record is one to be proud of.



smoother-running engines

Anything that tends to make a smoother-running airplane motor enhances by that much the value of the 'plane as a fighting unit. It means better conditions for pilot and observer, and probably a longer life for the 'plane.

Anything that tends to secure smooth running **quickly** helps to increase motor production by releasing skilled labor from the task of balancing.

The Carwen method of balancing crankshafts embodies an exact mathematical principle in simple mechanical form. It reduces the time spent in balancing from hours or even days to approximately **twenty minutes** per crankshaft.

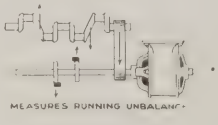
Any good mechanic can learn it in a few hours. The balance secured is very nearly perfect, and much better than obtainable by cut-and-try.

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This fabric has been developed from years of laboratory experience, and possesses every feature and qualification necessary to a well-balanced product, viz.:

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GAS-TIGHT
NEUTRAL, INVISIBLE COLOR

Withstands all Weather and Ages Well.

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Town of Cortina D' Ampezzo in the Alps, photographed from an aeroplane

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A. S. Burleson, Postmaster-General

$450,000,000 More Is Asked for Aircraft



The Anglo-American Corporation

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New York City

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AERIAL AGE WEEKLY

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VOL. VI. NEW YORK, MARCH 11, 1918 No. 26

$450,000,000 MORE IS ASKED FOR AIRCRAFT

RUNNING the year's appropriations for aeronautics to well above $1,000,000,000, the War Department, on March 4, asked Congress for $450,000,000 more for aircraft. In a letter to Chairman Chamberlain, of the Senate Military Affairs Committee, Acting Secretary of War Crowell said that the department was already obligated for $200,000,000 of this, and therefore this should figure as a deficiency bill. In addition to appropriating the money, which might be said to be already spent, or under contract, he asks for $250,000,000 more.

Following is Secretary Crowell's letter:

"I enclose herewith draft of a bill intended to supply urgent deficiencies in the appropriation for the purchase, maintenance, operation and repair of airships and for other purposes in the act approved July 24, 1917, and for other purposes.

"I am informed by the chief signal officer that there is a large deficiency in the appropriation referred to, even in view of the large amount covered by it, namely $640,000,000. It was anticipated that the amount required by the Signal Corps would be very large, but even our anticipations have been exceeded, and $200,000,000 is needed to supply deficiencies that have already arisen.

"Besides this amount of deficiency appropriation, namely, $200,000,000, there is incorporated in the bill an appropriation for $250,000,000 more. This is an appropriation for additional obligation for airships and all other Signal Corps materials and supplies. You will notice that the draft covering this appropriation is in the same form as the legislation covering the appropriation for the ordnance department in the act of October 6, 1917.

"This amount of $450,000,000 is all that is carried in the draft which I will now explain.

"The sum of $1,850,000, which is to be taken from the deficiency appropriation, is desired for the purchase of lands and the erection of buildings thereon or the purchase of lands and buildings in the District of Columbia for the purpose of placing a Signal Corps bureau entirely in one building. I have, however, caused the draft to be so made that, should occasion arise, the building can be used for purposes other than those of the Signal Corps.

"There is also a provision extending the appropriation of $640,000,000 until expended. The chief signal officer informs me that the expenditures under this appropriation cover such a broad scope that it is impossible to assure that the appropriation can be actually obligated before January 1, 1918. I am informed that telegrams are occasionally received from General Pershing, compliance with which necessitates the concellation of certain parts of existing contracts and the making of new contracts."

PRESIDENT FORBIDS PRIVATE FLYING

NO private flying will be permitted in the United States or its possessions after March 30. This announcement was made March 4 in a formal proclamation by President Wilson. The proclamation, which bears date of Feb. 28, was issued primarily to protect the national interests, the President announcing that the army and navy "are endangered in their operations and preparations by aircraft." The text follows:

1. A license must be obtained from the Joint Army and Navy Board on Aeronautics Cognizance by or in behalf of any person who contemplates flying in a balloon, aeroplane, hydroplane or other machine or device over or near any military or naval forces, camp, fort, battery, torpedo station, arsenal, munition factory, navy yard, naval station, coaling station, telephone or wireless or signal station, or any building or office connected with the national defense, or any place or region within the jurisdiction or occupation of the United States which may be designated by the President as a zone of warlike operations or of warlike preparation.

2. The license will specify the person to whom it is issued, the machine to be used, the persons to operate the machine and all other persons to be carried therein, the mode of marking or otherwise identifying the machine and other details intended to assure the military and naval forces of the peacefulness of the errand.

3. The license will also specify the territory and the time wherein it shall be available.

4. In case any aircraft shall disregard this proclamation or the terms of the license, it shall be the right and duty of the military or naval forces to treat the aircraft as hostile and to fire upon it or otherwise destroy it, notwithstanding the resultant danger to human life.

5. For the present the President designates as a zone of military operations and of military preparation the whole of the United States and its territorial waters and of the insular possessions and of the Panama Canal zone.

6. The provisions of this proclamation do not apply to aircraft operated by the Army or Navy of the United States.

24-CENT STAMP FOR MAIL BY AIR

Minimum Letter Postage on Letters by New Service Will Be 27 Cents

COINCIDENT with the opening of the first aerial mail route between New York and Washington on April 15 there will be issued a new stamp. This stamp will perform a function similar to the special delivery stamp, for it will cause the letter to which it is affixed to be sent by the air service. The present plan is to sell the stamp for 24 cents which with the regular postage will make the cost 27 cents. It will be cheaper and quicker than a night letter by telegraph.

The Post Office Department is at work on designs for the new stamps. It will be possible, Postmaster-General Burleson believes, to deliver the mail despatched from here by aeroplane in New York office buildings three hours after the mail closes in Washington.

At the start only one aeroplane will be despatched each way a day. Mail probably will close about 11 o'clock, making it possible for business men to answer their morning letters and get the answers delivered by 2 P. M. It is the belief of the officials that hundreds of business firms will avail themselves of the service.

The mail aeroplane will make one stop, at Philadelphia, but even with this it is believed that the trip between New York and Washington will be made in two hours, leaving one hour for the sorting and delivery of the mail carried.

Army Aeroplanes for Route

Service will begin with six aeroplanes. The machines will be furnished by the War Department in accordance with a cooperative agreement under terms of which the aero mail route will be used as training for military aviators. As the machines are of military type detailed description of them is not to be made public at this time.

The War Department volunteered to cooperate in the maintenance of regular mail service on the day that bids for six planes were opened by the Post Office Department. As a consequence each of the three bids submitted was rejected under the proviso in the invitation for bids in which the department reserved the right to reject.

The Washington-New York route is to be operated by military authorities for one year. The army will furnish all necessary machines and will detail all necessary aviators, mechanicians and repair men from the military training schools.

At the end of this year of military operation the Post Office Department will take over the service. Various types of planes are to be used by the army and postal authorities will get the benefit of the experience gained and will have opportunity to train its own men.

As a result it will be in position to specify the particular type of machine considered most suitable when it again asks for bids. In the recent invitation the specifications merely called for a machine capable of carrying 300 pounds of mail matter and with a maximum speed of 100 miles an hour with full load.

May Drop Mail by Parachute

The military machines to be used during the first year will be fully capable of this speed. In adition experiments are soon to be made with a parachute dropping device to test the feasibility of dropping the mail on the Post Office Building in New York city to overcome the difficulty of finding a suitable landing place within short distance of the post office.

Reserve machines ready for instant service are to be maintained at each terminus and at Philadelphia for use in case of a breakdown. In addition rapid motor wagons will be kept ready to rescue any machine compelled to make a forced landing along the way.

Officials here are confident that the service can be operated without a break with a mail each way each day.

New bids for machines for the Post Office Department probably will be asked well in advance of the expiration of the agreement made with the War Department so that the postal organization will be ready in every way to take up the burden.

During the first year a limited number of graduates of the army flying school will be assigned to a tour of duty on the mail route to complete their training before going to France. The War Department expects to benefit not only from the testing operation of biplanes under severe service conditions, which will require flights under every condition of climate to be found in the Temperate Zone.

FRANCE COMMEMORATES WRIGHTS' ACHIEVEMENTS

At Impressive Ceremonies Commemorating First Flight in France Mayor de Lassence Predicts Victory Through American Pilots.

TWO hundred English speaking guests assembled Sunday, Feb. 3, in the ballroom of Hotel Gassion, Pau, France, to assist at the celebration of the ninth anniversary of the flight of Wilbur Wright. Pau, with its even temperature, its sunlight, its mild air, offered inducements that brought the American aviator here to give scope to his winged machine.

The American colony in Pau is an important one, and the fete was arranged for them, not only to commemorate the memorable day, but as a kind of acknowledgment of the untiring aid Americans in Pau have given in nursing the wounded, offering shelter to refugees and materially aiding the cause of the Allies both before America came into the war and since.

After the banquet, the Mayor of Pau, M. Alfred de Lassence, who has an English mother and an American wife, made his speech in English. He said: "Many of you remember that afternoon of the 3d of February, 1909, when between the big white wings of his biplane, for the first time, we saw Wilbur Wright fly. We were waiting, our feet chilled in the clay of the Pont Long, our hearts eager with expectation. The little white flag registering the air was quiet; our honored guest put on his coat, his cap, drew on his gloves. We held our breath. A brief order, and the biplane slid from the pylon and soared toward the setting sun. It came back over our heads, made several circles round its hangar and sought its resting place as a bird when it comes home.

"We were pale with emotion, mute with wonder. We knew we had seen something very great, the greatest conquest ever made by man over the forces of nature, the boldest deed ever achieved by science and by skill. We drove home reflecting and pondering. At 5 o'clock teas at the club, in after dinner conversations, we wondered what would be the practical results of Wilbur Wright thus opening the roads of the air to humanity.

"Tissandier, Jacques Balsan, Hubert Latham, thought they would make a sport of it and spoke of using their aeroplanes to go to race meets. Deutsh de la Meurthe ordered a special carrosserie to be taken comfortably against rain and wind. Bleriot contemplated carrying mail across the English Channel and over central Europe.

"But the most interesting discussions were among military men. Was the cavalry to remain necessary to an invading or retreating army? Would the aeroplane get the farseeing eye of the Commander-in-Chief? In 1913 we had a rather interesting experience. We had autumn manœuvres in this part of the country, and a dirigible was sent and equipped in our hangar of the hippodrome.

"The last day of the manœuvres of the summer of 1914 the officers of the dirigible and the officers of our aviation school dined with me. They had seen everything; the positions of cavalry, artillery, infantry, the manœuvres of the day, the final and brilliant charge of the infantry at the spirited blasts of 'Sambre and Meuse.'

"While we were thus discussing war and leading that charmed and easy life that probably the world will never see again, like thunder from a clear sky came the summons to war.

"Germany alone had understood the use she could make of aviation in directing the fire of heavy artillery and she had prepared her taubes with the same stealth as she had built her submarines.

"The French at Charleroi, the English at Mons, had learned the deadly lesson of the new aerial weapon; but notwithstand-

(*Continued on page* 1170)



THE NEWS OF THE WEEK



President Wilson Urges Speed on Aircraft Programme

Washington, March 5—Further speeding up of America's aircraft programme is understood to have been urged by President Wilson on Howard E. Coffin, chairman of the Aircraft Board, to-day. Mr. Coffin called at the White House to outline the board's enlarged programme under the additional funds asked of Congress since the appropriation of the initial $640,000,000. Production of both battle and training planes is increasing rapidly, Mr. Coffin said.

To Make Long Island Greater Air Camp

The first contingent of the fliers who are to complete their training there during the next few weeks have arrived at Hempstead. It is expected that their numbers will be increased with the arrival of each train coming from Texas, Louisiana and other southern States in which there are aviation camps, as all are being emptied into the Long Island finishing school.

Fixes Price of Aluminium.

Announcement was made March 4, by the War Industries Board that President Wilson, after investigation by the Federal Trade Board, as to the cost of production, has approved on agreement made with the producers of aluminium, fixing a maximum base price of 32 cents a pound at the various American plants, and their subsidiaries, subject to revision on June 1, 1918; such price to cover lots of fifty tons and over of ingots of a grade 98 to 99 per cent.

The differentials now in force for the different grades, quantities, and shapes will continue in force for new contracts.

The conditions of the agreement are:

First—That the producers will not reduce the wages now being paid.

Second—That they will sell to the Allies, to the public, and to the Government at the same price.

Third—That they will take the necessary measures, under the direction of the War Industries Board, for the distribution of the aluminium to prevent it from falling into the hands of speculators, who might increase the price to the public.

Fourth—That they pledge themselves to exert every effort necessary to keep up the production of aluminium so as to insure an adequate supply as long as the war lasts.

American Representatives to Aircraft Standards Conference Arrive in England

The American representatives to the International Aircraft Standards Conference to be held in London, have arrived safely, the Aircraft Board announced.

The American delegation is headed by F. G. Diffin, head of the International Aircraft Standards Board, and the other members of the coneference are: Dr. W. F. Durand, Lieut.-Commander Benjamin Briscoe, Lieut. W. F. Prentice, Coker Clarkson, E. H. Ehrman, Charles M. Manley, James Hartness, Albert L. Colby, F. G. Ericson, Capt. A. B. Tilt and F. R. Baxter.

The purpose of this interallied meeting, which is the result of the efforts of Mr. Diffin, is to enable better industrial service to be given with less man-hour effort, through relieving plants from carrying in stock unstandard materials for which there is small call, and concentrating on materials of known performance for the same work.

Aeronautic School for Carnegie Institute

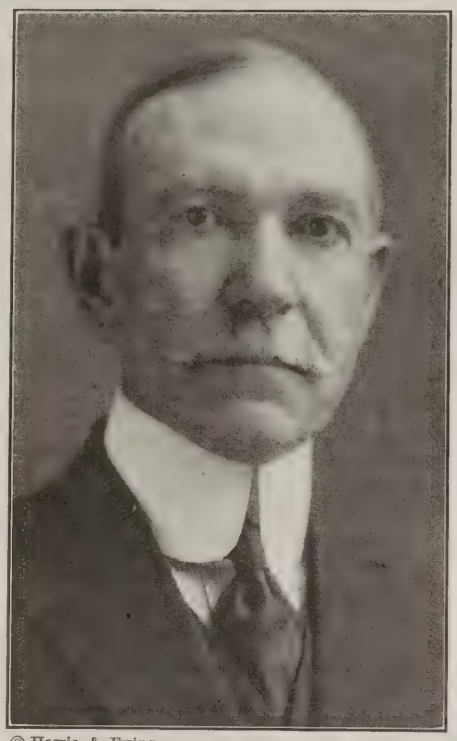
An aeronautic school is to be erected at once at the Carnegie Institute of Technology here, according to official announcement made by Director A. A. Hammerschlag, following a meeting of the trustees. The aero building, which, it is said, will be ready for use within thirty days, will be constructed under the direction of the Institute Building Bureau, and will be named "The Langley Laboratory of Aeronautics," after Prof. Samuel Pierpont Langley, the well known Pittsburgher, who is credited with having discovered the secret of flight.

Baruch Named Chairman of War Industries Board

Bernard Baruch was named Chairman of the War Industries Board, succeeding Daniel Willard, who resigned.

Baruch, it is understood, will have broad powers. In testifying before the Senate Committee considering the proposal for a minister of munitions, he strongly urged a central organization for purchasing supplies for the Army and Navy, and other centralization of war work. It is expected he will fill to a great extent the functions of a minister of munitions without holding a cabinet seat.

Mr. Baruch is a prominent member of the Aero Club of America.



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Mr. R. F. Howe, of New York, a director of the International Harvester Co., appointed a member of the Aircraft Board.

Queen City Aero Club Elects New Officers

The Queen City Aero Club of Cincinnati, Ohio, has elected the following officers of the Club for the year 1918: President, W. L. Marks; Vice President, L. V. Linden; Secretary, L. A. Horn; Treasurer, A. Spreen; Trustees, W. G. King and L. Losekamp.

Mr. Marks, the President of the Club, is in the Aviation Section, hence his duties will devolve on Mr. Linden, the Vice President. Mr. Linden has also been elected to take care of the duties of the Secretary, Mr. Horn being out of town on business. The school machine will be completed soon and field work will begin immediately.

Manufacturers Cooperate with Spruce Division

Ralph C. Angell, of the lumber firm of Angell & Sturgeon, has been selected as manager of the spruce division of the West Coast Lumbermen's association and will leave Salt Lake next week for headquarters in Portland, where he will represent the lumber interests in their dealings with the government in the production of spruce and fir for the nation's aeroplane programme.

Mr. Angell will act in the nature of a buffer between the representative of the government and the lumber producers and, by devising methods of avoiding possible friction and to coordination of effort, will endeavor to accelerate the delivery of the immense amounts of material needed in the construction of the American air fleet.

Mr. Angell has just returned from Portland, where a conference was held of the spruce division of the association. The government has not commandeered the sawmills and logging plants and the producers wish to avoid this by speeding the delivery of lumber through closer cooperation and the stoppage of waste motion and useless and duplication of effort. This will be Mr. Angell's task.

Third Civilian Member of Aircraft Board Nominated by President

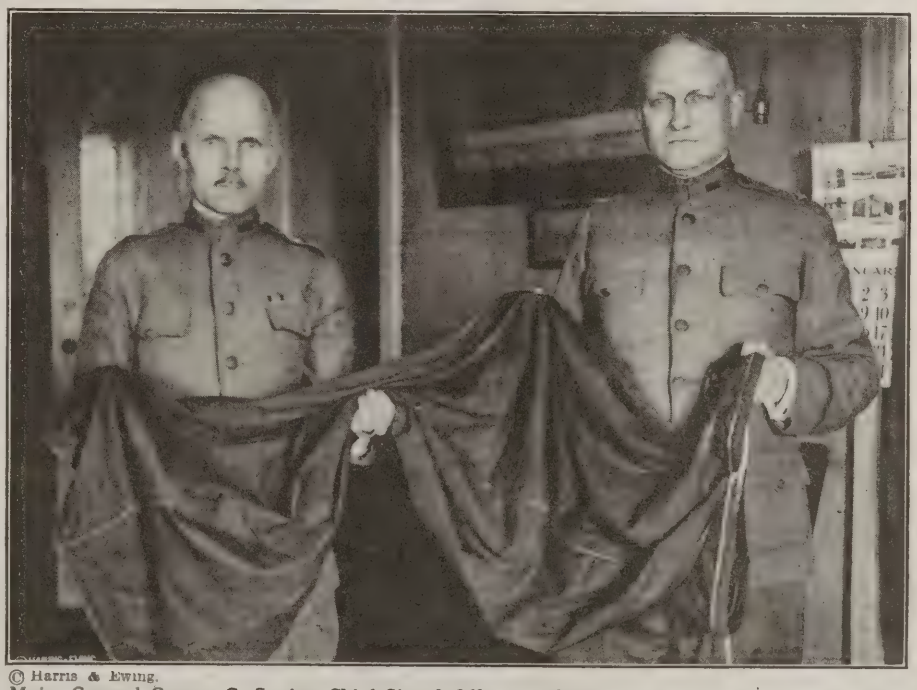
President Wilson has tendered to H. K. Thayer, President of the Western Electric Company, an appointment as member of the Aircraft Board. If Mr. Thayer accepts, it will complete the civilian membership of the Aircraft Board, Mr. Howard E. Coffin, chairman, and Mr. Howe of the Harvester Co. being the other two civilian members of the Board.

Patriotic Brazilian Aids Country's Air Service

Alfred Correa Daudt has just been given permission by the American Government to take a course at the School of Military Aeronautics, Massachusetts Institute of Technology.

Mr. Daudt realized the need of an air service for Brazil over a year ago, having been interested in aeronautics for many years. When Brazil broke relations with Germany, he undertook, at his own expense, an extensive trip through the United States in order to acquaint himself with American methods of training aviators, for the purpose of assisting his country in her development of an air service.

Arriving in New York, he sought Mr. Alan R. Hawley, President of the Aero Club of America, who advised him to go to the Massachusetts Institute of Technology. While awaiting official permission to go to the Military School at that place, he studied the construction and handling of modern aeronautic motors at the Sturtevant Aeroplane Co. Mr. Daudt has won the encomium of the Brazilian Mission for his very patriotic and practical effort.



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Major-General George O. Squier, Chief Signal Officer, and Colonel E. A. Deeds, examining the red flag of the Zeppelin L49, presented to the Marine Corps by the French officers who brought the airship down.

Air Service Needs Photographers

One thousand men trained in photographic work are needed by the Signal Corps before March 10, for instruction at the new school for Aerial Photography just opened at Rochester, N. Y., preparatory to going overseas.

This ground force for America's aerial photography requires three types of men:

1. Laboratory and dark room experts, especially fast news photographers, familiar with developing, printing, enlarging, retouching, finishing, and panchromatic photography, who, can take a plate from the airman and hand it over ten minutes later a finished enlargement to the staff officers. These men will work in motor lorries as close to the front and to the staff as possible.

2. Men able to keep the whole delicate equipment in good condition, such as camera and optical construction and repairmen, lens experts, cabinet-makers, instrument makers, etc.

3. Men to fit the finished prints into their proper places in the photographic reproduction of the German front, to work out the information disclosed, and to keep the whole map a living hour-to-hour story of what the Germans are doing. This includes men familiar with map compilation, map-reading and interpretation, topographical science, and drafting, and requires keen analytical powers.

The primary training at Rochester will cover four weeks, and will be standardized along the highly specialized developments brought out in the war. At its close the successful graduates will be sent on for a month of advanced training, after which they will be organized into units and sent overseas.

The best men, however, will be given still further training for commission as Photographic Intelligence Officers, first at one of the schools and then in actual flights at the flying fields.

Many men not physically fit for line service are eligible for this so-called limited military service, as defective vision corrected by glasses and other minor physical disabilities are waived. The proportion of officers and non-commissioned officers to privates will be higher here than usual, so that the opportunity for advancement is good.

Men not registered for the draft, and who possess the necessary qualifications, should write to the Air Division, Personnel Department, 136 K St., N. E., Washington, D. C., for information as to enlistment, accompanying their letters with evidence of their qualifications.

Men registered for the draft in the States of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Missouri, Massachusetts, New Jersey, Rhode Island and Maryland, who desire to be voluntarily indicted for this service, should apply to their Local Board and submit evidence of their qualifications. At present these are the only States to which this call applies.

Owing to the shortness of time, it is requested that only men fully qualified apply for this service.

To Teach Americans in France

The University of Paris is preparing a special course for Americans to learn the language, literature, art and history of France.



Lieut. Roy Flickinger, in charge of school for mechanical instruction, Chanute Field, Rantoul, Ill.

No diploma will be given as it is intended to meet the needs of American students.

An association of professors has been formed to look after the well-being of Americans in the schools and to introduce them into French families.

Public Test of Liberty Motored Aeroplane to be Made at Washington

The first public flight of an aeroplane equipped with the Liberty motor will be made in Washington soon. Representative Hull of Iowa, said in announcing that arrangements had been completed to give congressmen an opportunity to see the new engine in action.

Representative Hull, who made a flight recently with Col. Lee of the British Royal Flying Corps, also announced that an American army aviator will be chosen to pilot the American machine.

Congressmen who have been watching the recent flights of Col. Lee will have a chance to compare the British Rolls-Royce with the American product.

The tests will include distance and speed flights and military air maneuvers will be made in conjunction with the flights of Col. Lee.

New Lincoln Highway Head

In the election of Mr. F. A. Seiberling as president of the Lincoln Highway Association, succeeding Mr. Henry B. Joy, who has entered the aviation section of the government service, one of America's big men has been called to direct the affairs of the most important public highway in the United States, if not in the world.

Mr. Seiberling is president of the Goodyear Tire & Rubber Co., of Akron, Ohio, and brings to his new office a record of achievement that has few counterparts in American industry. After a varied business experience, he founded, in 1898, the big rubber concern of which for nineteen years he has been the active head, and which today, with its $110,000,000 annual business, stands a monument to his business and financial genius.

As director of the United States Chamber of Commerce, he has spent much time during the last few months in Washington, and is in close touch with the government's war program, and alive to the importance of the Lincoln Highway in the great transportation problems that must be worked out to make the government's program a success.

About ten months ago President Seiberling, sensing the transportation conditions that since have appeared, established a long distance motor truck line between Akron, Ohio, and Boston, Mass., operating over the Lincoln Highway from Pittsburgh to New York. This line is used by the Goodyear company to transport tires to its Boston branch and to bring back fabric from its cotton mills in Connecticut. The success of this line has encouraged many others to inaugurate similar lines, although operating over shorter distances, until today the Lincoln Highway is being used to transport many tons of important finished and raw materials to the eastern seaboard.

The new president, although a man of big affairs, has indicated that he will devote a sufficient amount of his time to insure the carrying out of the extensive improvements to he made on the highway this year.

"This will be the greatest year in the Lincoln Highway's history," says Mr. Seiberling. "Although shortages of labor and building material will affect our big program somewhat, we hope to carry out our plans for making this transcontinental roadway the best in America. The winning of the war may depend largely upon the use made of this great highway. We see this emphasized now in the transportation of army trucks under their own power to eastern seaports for shipment to France. A train of thirty army trucks is leaving Detroit daily, all of which are operating over the Lincoln Highway. Hundreds of business houses in the east have purchased trucks from the middle west factories and have been unable to obtain satisfactory delivery by railroad, and are having them driven through, largely over this highway, even in the face of the heavy snows and extreme cold weather.

"We are alive to the great importance of this great roadway in speeding up our war activities, and are planning to expend approximately $4,000,000 this year in actual road work."



Guests and principals at the recent marriage of Lieut. Lawrence B. Sperry. Left to right: Mr. N. W. Dalton and children, Perley Noyes, Ralph de Palma, Miss Winifred Allen (now Mrs. Lawrence B. Sperry), Mrs. Lindsey Reed, Lieut. Lawrence B. Sperry, Thomas A. Morgan, and Mr. Sperry's mechanician.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
EHT—Report to Ellington Field, Houston, Tex.
ELA—Report to Eberts Field, Loanoke, Ark.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from active duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
THT—Report to Taliafero Field, Hicks, Tex. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDO—Report to Wilbur Wright Field, Dayton, Ohio.

Note 1. Report to Signal Corps Camp, Dallas, Tex.
Note 2. Report to district manager of inspection, 870 Woodward Ave., Detroit, Mich.
Note 3. Report to Pawtucket, R. I.
Note 4. Report to commanding officer, 309th Cavalry, N. A., Fort Sam Houston, Tex.
Note 5. Report to New Haven, Conn.
Note 6. Report to Chicago, Ill.
Note 7. Report to School for Radio Mechanics, Carnegie Institute of Technology, Pittsburgh, Pa.
Note 8. Report to headquarters, Southern Department, as aeronautical officer of that department.
Note 9. Report to commanding officer, training section, air division, Washington, D. C.
Note 10. Report in person to the Secretary of War.
Note 11. Report to Signal Corps Troops, Arcadia, Fla.
Note 12. Report to Major C. M. Hall, equipment division, Dayton, O.
Note 13. Report to Riverbank Laboratory, Geneva, Ill.
Note 14. Report at Dayton, Ohio.
Note 15. Report with detachment of seven enlisted men of 501st Aero Construction Squadron.

Special Orders 38 to 45, Inclusive

A

Aime, Frank Louis.....SLR; THT (1)
Anderson, Walker, Jr.....UTA
Ashwell, George Gouverneur.....SLR; CMV
Alvey, Paul.....SLR; GLC
Ahlgren, Arthur R.....SLR; HHN
Akers, J. R. Homer.....SLR
Augur, Murray B.....SLR
Aldrich, Perry H.....SLR
Ashley, Harold H.....SLR
Anderson, Albert E.....OSU
Abott, Walter S., Jr.,.....FLR; KST
Amspacher, James W.....FLR; KST
Ault, Leo V.....FLR; KST
Abbott, Melvin J.....CPR
Ashton, Thomas Hutchinson.....SLR; FOB
Andrews, Edward Williamson.....SLR; GLC
Anderson, Frank Alexander.....SLR; LHV
Andrews, Roy M.....UTA
Arthur, Dogan Humphries.....SLR; GLC

B

Burke, Edmund Jerome.....SGS
Bardwell, Darwin E.....SLR; GLC
Brewster, Hugh.....FRF
Bush, Ralph R.....CPR; MIT
Brooks, John P.....FLR; GLC
Bonnell, Geoffrey H.....FRF
Baxter, James L.....UTA
Borden, Cecil A.....SLR; KST
Bowser, Henry Reed.....FLR; CSO
Banning, Kendall.....WCW
Brockway, William Northrop.....SLR; CSO
Bird, Byron.....SLR; ELA
Bissell, Clayton L.....FRF
Bergbom, Charles E.....SLR
Brackett, Elmer Eugene.....FLR; MIT
Bengs, Milton A.....CPR; KST
Burnett, Robert L., Jr.....CPR; KST
Bell, Charles.....SLR; KST
Brown, Harry Leonard.....FLR; CSO
Bates, Grahame M.....UTA
Brinsmade, James Beebee.....FLR; CSO
Brooks, James H., Jr.....UTA
Bondurant, David S.....FRF
Bassett, Herbert Boutwell.....MSC; SLR
Battey, Bryan M.....FRF
Benson, Robert Henry.....SLR; GLC
Benet, William Rose.....SLR; THT
Blackman, Berkeley.....SLR; THT
Bowman, Samuel Cavin.....SLR; THT
Bowles, Walter Sheriff.....SLR; EHT
Baird, Harold Chambers.....SLR; EHT
Barr, Eugene Osmun.....SLR; GLC
Baxter, George Roswell.....SLR; GLC
Billups, Val T.....SLR; EHT
Baskey, Earl Frederick.....SLR; EHT
Buckley, John Harold.....SLR; GLC
Burns, Thomas Russell.....SLR; GLC
Bowen, Charles Clark.....SLR; THT
Buckner, Frank.....FRF
Boggs, Marshall S.....FRF
Baker, Earl R.....SLR; HHN
Barlew, Stephen M.....CAP
Brooks, J. Ansel.....CPR
Bainbridge, John C.....SLR
Baird, Veech T.....SLR
Brockhart, Virgil.....SLR
Brooks, Leverich.....SLR
Bunkley, William H.....SLR
Beard, Paul E.....SLR
Baez, Raphael, Jr.....SLR; EHT
Boyd, Beverly Munford.....SLR; EHT
Burge, Edwin.....SLR; KST
Bachelder, Harold K.....FLR; KST
Bazell, Grover C.....FLR; KST
Belknap, Carroll Y.....FLR; KST
Bidwell, William M.....FLR; KST
Blackburn, Glen R.....FLR; KST
Blackstone, Edwin C.....FLR; KST
Blome, Maurice H.....FLR; KST
Boedker, William F.....FLR; KST
Bond, William T.....FLR; KST
Borah, Wayne G.....FLR; KST
Boyd, Guy F.....FLR; KST
Brennan, Charles J.....FLR; KST
Brown, Robert A. B.....FLR; KST
Burnett, Edwin M.....FLR; KST
Bush, Clarence R.....FLR; KST
Belford, Fred H.....SLR; SMM
Bornsfeld, Harold T.....SLR; SMM
Bliss, Francis W.....FLR; KST
Bowen, William S.....FLR
Boyle, Robert D.....SLR
Blee, Harry H.....CAP
Bryant, Frank A.....FLR
Bancker, William D.....SLR
Blakeley, George W.....SLR
Braid, William G.....SLR
Braun, Arnold W.....SLR
Buck, Edward H.....SLR
Burrall, Hallett J.....SLR
Byerly, Frederick Marion.....SLR; GLC
Baker, Alfred B.....FRF
Bancroft, Amos R.....UTA
Bennett, John James, Jr.....SLR; CSO
Bevan, William Alfred.....FLR; MIT
Bright, Elijah A.....SLR; KST
Bennett, Samuel Crocker, Jr.....SLR; CSO
Bauerfeind, Lanus E.....MIT
Bond, George Arthur.....SLR; GLC
Burton, Elbert F.....AAD; MIT
Blake, Joseph F.....AAD; MIT
Bellows, Franklin B.....SLR; AGC
Black, Edward C.....SLR; AGC
Brown, H. Mitchell.....SLR; AGC
Buell, Maurice L.....AAD; MIT
Butler, Edward F.....CPR
Bond, George Clair.....SLR; GLC
Barry, M. C.....UTA

C

Coxeter, Roberts Arthur.....CPR; CGC
Connolly, Bernard F.....UTA

Carroll, Franklin O.....FRF
Chisum, Jenner Y.....MAJ; RWT
Canute, Olin Jacob.....FLR; RWT
Culp, Alexander Banks.....SLR; MIT
Caughey, Arlington Rollin.....SLR; CMV
Chandler, Leslie G.....FRF
Coe, Frank A.....SLR; KST
Crawford, Russell Tracy.....MJR; FOB
Curtin, John Joseph.....FRF
Crosby, Lloyd R.....FLR; VBW
Clark, Eugene Caldwell.....SLR; RSD
Clarke, Alexander H.....FLR; GIT
Colton, Arthur W.....FLR; GIT
Crockett, Eugene Wirt.....MAJ; FOB
Cozzens, John Howard.....SLR; MIT
Coleman, James I.....FLR; HHN
Cookingham, Prescott W.....SLR; VBW
Collins, Paul Fisk.....SLR; EHT
Cook, Charles Ira, Jr.....SLR; EHT
Calef, Robert Chambers.....SLR; EHT
Clark, Kenneth Lucius.....SLR; GLC
Chapin, Charles Graham.....SLR; EHT
Chamberlin, Arthur N.....SLR
Clark, Arthur L.....SLR
Clark, Harold Lyman.....SLR; GLC
Callahan, Jesse A.....FLR; KST
Carrico, Isaac B.....FLR; KST
Cawthon, Frank W.....FLR; KST
Chennau, Claire L.....FLR; KST
Clark, Holland R.....FLR; KST
Cooper, Arnold D.....FLR; KST
Conrad, Lawrence L.....FLR; KST
Costello, John M.....FLR; KST
Chase, Samuel Wood.....SLR; KST
Cowgill, John R.....FLR; KST
Crim, Floyd D.....FLR; KST
Curtis, Emmett L.....FLR; KST
Cabot, James J.....SLR
Christopher, Luke .....SLR
Cone, Clarence N.....SLR
Christopher, Gerald .....FLR
Clarkson, Robert C., Jr.....SLR
Campion, John L.....SLR
Channing, John .....SLR
Crowell, Elmer A.....SLR
Cary, Edward Austin.....SLR; EHT
Cochran, Robert J.....FLR; AGC
Carrington, George Dart.....KST (2)
Chadwick, Stuart .....SLR; GLC
Clowes, Lloyd Roberts.....SLR; GLC
Coletti, Vincent Joseph.....SLR; GLC
Crummey, James Michael.....SLR; GLC
Crawford, Daniel McLauchlan.....SLR; GLC
Centner, William F.....FRF
Coit, Charles .....FLR; CSO
Camp, Julian William.....SLR; GLC
Cain, Hubert O.....FLR
Clark, George S.....FRF
Crumb, Harry C.....SLR; AGC
Coleman, Wallace A.....FRF
Carroll, William F.....AAD; MIT
Chapman, W. Vincent.....FRF
Cannon, Lawrance Hayward.....SLR; EHT
Campfield, Hugh Cady.....SLR; GLC
Cleveland, Robert Linsted.....SLR; GLC
Coney, William Devoe.....SLR; KST
Clune, Edmund A.....SLR
Carlisle, Russell B.....SLR; AGC
Cochran, Robert J.....SLR; AGC
Coghill, Frank J.....SLR; AGC
Cohn, Robert L.....SLR; AGC

D

DeWald, William N.....FRF
Devaney, Leo Giles.....FRF; SLR; KST
Davis, John Evan.....SLR; EHT
Dunlap, John Robertson, Jr.....SLR; EHT
Duke, Jack E., Jr.....UTA
Davison, Ralph E.....DIS
Dabney, Henry B.....CPR; VBW
Dinger, Jean T.....SLR; CSO
Daugherty, John E.....SLR; OSU
Duble, Norman .....SLR; THT
De Montel, Elmer C.....SLR; THT
Daly, Edward J.....SLR; THT
Dodd, Maurice R.....SLR
Drummond, Frank C.....SLR
Duckstein, Arthur W.....SLR
Dyer, George S.....SLR
Drake, Joseph W.....OSU
Davis, Theodore W.....SLR
Dougherty, Harry R.....FLR
Daly, Herbert A.....FLR; KST
Denton, Velpeau C.....FLR; KST
Dunbar, John B.....FLR; KST
Darby, Alexander L.....FLR; KST
Darling, Harold P.....SLR
Duke, Donald G.....SLR
Drury, Alden M.....SLR
Denis, John Francis.....FLR; GIT
Dick-Peddie, William Scott.....SLR; KST
Daniel, William I.....FRF
Davis, Raymond E.....FRF
Darnell, Rezneat M.....MIT
Dehringer, Homer W.....SLR; AGC
Drew, Francis L.....SLR; AGC
de Castro, Ralph Ellison.....SLR; GLC

E

Emery, Herbert E.....FLR; KST
Eckart, Herbert E.....FRF
Egan, T. Francis.....SLR; CDT
Erdmann, Robert W.....UTA
Eberle, Sidney S.....UTA
Edson, Carroll A.....UTA
Eubank, Eugene Lowry.....SLR; KST
Eyre, Edward Engle.....SLR; THT
Enlow, Charles Easton.....SLR; THT
Ernst, Norman Conrad.....SLR; EHT
Eden, John H., Jr.....SLR; THT
Elliot, Frank T.....SLR; THT
Eddy, Paul Lyndon.....SLR; GLC
Evans, Steele .....SLR
Evans, Walter G.....OSU
Ellis, Sam Love.....SLR; GLC
Earhart, Glen W.....FLR
Edwards, Chester H.....FLR
Epperson, Arthur R.....SLR
Eaker, Ira C.....UTA
Evans, Mark H.....CPR
Elwood, Philip H.....CPR
Evans, Griffith Conrad.....CPR; CSO
Ennis, Frank S.....FRF
Ehrenberg, Conrad Edward.....SLR; KST
Evans, Earl Francis.....SLR; KST

F

Fitzsimons, Richard Anthony.....SLR; KST
Foster, Arthur L.....REV
Franklin, Elbert Wiley.....SLR; KST
Faist, Carl J.....SLR; CSO
Farnam, Julian Perkins.....SLR; MIT
Fitzmaurice, William J.....RSD
Franklin, Luther G.....ELA
Foote, Charles Lincoln.....SLR; OSU
Fernald, Reginald Goodwin.....SLR; THT
Ford, Robert McFarlin.....SLR; THT
Floyd, Robert Kendall.....SLR; KST
Ferris, William R.....FRF
Fries, Waldemar H.....FRF
Ferguson, Otto .....SLR; GLC
Foss, George Albert.....SLR; GLC
Frost, Robert C.....SLR
Frazier, Frank D.....OSU
Fitzpatrick, Kirby .....FLR
Fowler, Joseph W., Jr.....FLR
Flaherty, John J., Jr.....SLR; SMM
Falk, Frederick F.....FLR; KST
Flanders, George S.....FLR; KST
Foye, Edward D.....FLR; KST
Fry, Carl B.....FLR; KST
Foote, Kenneth M.....FLR; KST
Freeze, Jackson L.....SLR
Fredell, Edwin J.....FLR
Fonseca, Francis M.....SLR
Fitzgerald, Gordon P.....SLR
Fuhrman, Daniel Kennedy.....SLR; GLC
Funger, Robert A.....MIT
Freydig, Paul E.....FRF
Fosnight, Reed O.....UTA
Faison, George W., Jr.....SLR; KST
Fanning, Winthrop Coit.....SLR; GLC

G

Gesner, Carleton Peck.....SLR; LHV
Galleher, Harry Ernest, Jr.....SLR; CSO
Glenn, George Preston.....FRF
Garrett, Claude S.....FRF
Gunther, Abraham Lincoln.....CPR; CSO
Gerlach, Fred L.....CAP; VBW
Garber, Ray O.....SLR; KST
Gilbreth, Florian R.....UTA
Griswold, Clifford Burnham.....CPR; MIT
Griffin, Thomas S. P.....SLR; KST
Gish, Daniel B.....FRF
Greene, Stephen H.....SLR; RSD
Galt, Freeman P.....UTA
Guy, Thomas J.....UTA
Green, Alfred Marion.....SLR; GLC
Gatch, Nelson Burns.....FLR; EHT
Geisendorf, Louis Charles.....FLR; EHT
Gregory, Julius Elmer.....FRF
Gothlin, Oliver P.....FRF
Gibson, James W.....UTA
Gelwicks, Myles Wellington.....SLR; EHT
Gale, Harold DeForrest.....SLR; EHT
Goodale, Alvin .....SLR
Grisham, James L.....SLR
Greeley, Sidney F.....UTA
Gillin, James M.....OSU
Grantz, Raymond Lorimer.....SLR; EHT
Gianniny, Lawrence Gleason.....SLR; KST
Givens, William H.....FLR
Gillson, George B.....SLR; SMM
Garver, John B.....SLR
Grant, Sidney B.....SLR
Gose, John H.....FRF
Gibson, Ralph A.....SLR
Gale, Henry G.....CPR
Gell, Harry .....SLR; CSO
Groves, James R.....SLR; AGC
Greene, Carl F.....AAD; MIT
Gillett, John Doyle.....SLR; GLC
Godman, Louis K.....FRF

H

Hightower, Charles D.....FRF
Hunt, Wesley Jackson.....FRF
Healy, James A.....FRF
Hoff, William H.....FRF
Henry, William H.....FRF
Hutchinson, George C.....UTA
Holmes, Raymond M.....UTA
Hagan, Eugene .....UTA
Hebert, Oscar Joseph.....SLR; CGC
Harris, Julian N.....AAD; CSO
Hammond, C. B.....FLR; CSO
Holcomb, William R.....MIT
Hesser, E. B.....CDT
Hoopes, Eugene Sargent.....CPR; GLC
Hawley, Alfred D.....SLR; GIT
Highley, Thomas H.....FRF
Henshaw, Griffith .....SLR; THT
Hanes, Harold F.....CWT
Hatch, Horace McKinley.....SLR; THT
Hartigan, John D.....SLR
Hazen, Jerry M.....SLR
Henry, Charles A.....SLR
Hale, Henry T.....OSU
Hill, Charles A.....OSU
Hagman, Charles A.....OSU
Hamilton, Stewart Alexander.....SLR; GLC
Hawkins, Raymond E.....FLR
Herndon, James P.....FLR
Hudson, James L.....FLR
Hyter, Ernest H.....FLR
Henderson, Tom S., Jr.....SLR; SMM
Harp, Charles E.....FLR; KST
Healy, Ledru R.....FLR; KST
Hoddick, Alvin C.....FLR; KST
Humphrey, Charles E.....FLR; KST
Harwood, Barney M.....FLR; KST
Hill, Maurice S.....SLR
Harrison, Travis L.....SLR
Hall, John W.....SLR
Hill, Armistead B., Jr.....SLR
Horne, George W., Jr.....SLR
Hutchinson, James T.....FRF
Hellenberg, Frederick W.....FLR
Henderson, Albert B.....SLR
Hoag, Earl S.....FRF
Hobbs, Edward H., Jr.....SLR; AGC
Hogg, Robert L.....SLR; AGC
Horstmann, Walter G.....SLR; AGC
Hayes, Daniel W.....CPR



British Official Photo

Aviators donning electrically heated overcoats prior to a long distance reconnaissance flight.

Holt, McPherson .....FLR
Hartle, Russell Peter.....CSO
Hyde, Clarence E.....FRF
Horton, Charles M.....AAD; MIT
Huner, Franklin Koster.....SLR; KST
Horton, Elwood .....PUP
Hooven, Robert Leonard.....SLR
Hoag, Elbert C. H.....AAD; MIT

I

Ireland, Thomas H.....FRF
Ingersoll, Hamilton .....SLR; MIT
Imes, Terrance W.....SLR
Immel, Paul P.....REV; HHN

J

Jackson, John S.....UTA
Jewell, Sidney Lloyd.....SLR; GIT
Johnston, Elmo Grover.....SLR; EHT
Jacob, William Carl.....SLR; EHT
James, A. Van.....FRF
Johnson, Arthur T.....SLR
Johnson, Andrew B.....OSU
Jenkins, Winfred G.....FLR
Jackson, Abner G.....FLR; KST
Johnson, Samuel .....FLR; KST
Janda, George W.....FLR
Jackson, Clyde H.....SLR
Jefferson, Theodore .....SLR
Jones, Daniel B.....AAD; MIT
Johnson, Harlan W.....SLR; AGC
Johnson, Arthur W.....FRF
Jones, William Myers.....SLR; GIT
James, Edwin Donald.....SLR; EHT

K

Kearney, Thomas E.....FRF
King, William G.....FRF
Keeney, Douglas .....UTA
Kingsbury, Joseph J.....CPR; FOB
Kerr, Chichester Charles.....FLR; CSO
King, Royal W.....AAD; SMM
Kolbe, Frank P.....AAD; CSO
Knight, Climpson M.....FLR; TMA
Kenyon, Horace S., Jr.....FRF
Kennedy, Thomas E.....SLR; THT
Krapf, George W.....CWT
Kelly, Sherman Finch.....SLR; EHT
Koepfgen, Leslie Philip.....SLR; GLC
Kinsley, Willburt Edward.....SLR; GLC
Kendall, John Dwight.....SLR; GLC
Kropf, Walter John.....SLR; FOB
Ker, David .....SLR
Keeler, Edwin R.....UTA
Kugler, Martin Billmire.....SLR; EHT
Keffer, Albert H.....FLR
Kampman, John V.....FLR
Key, Marshall K.....FLR
Kelly, James Nelson.....SLR; KST
Kane, Clarence P.....SLR; SMM
Klubock, Samuel Roger.....SLR; SMM
Keck, John H.....FLR; KST
Kennedy, James G.....FLR; KST
Kiskaddon, George C.....FLR; KST
Kelly, Carl D.....FLR
Killough, Hugh B.....SLR
Kuntz, Frank E.....SLR
King, George E.....FLR
Kaufmann, Godfrey E.....SLR
Kenyon, Johnson D.....SLR
Keough, Wesley L.....SLR
King, Olen .....SLR
Kittredge, Albert Ray.....SLR; SBI
Keenan, Walter M.....AAD; MIT
Kent, Warner Williams.....SLR; SBI
Kirkby, Kent Shirley.....SLR; GLC
Kellogg, Albert B.....FLR
Kennedy, Thomas G.....SLR; AGC
Kane, Henry F.....CUI

L

Lawrence, Mortimer M.....SLR
Logan, Harold B.....OSU
Luscher, Carter .....SLR; KST
Leonard, Charles M.....FLR
Lucas, Malcom .....FLR
Leath, Giles J.....SLR; SMM
Levy, Edward J.....FLR; KST
Lilly, Roy M.....SLR; GIT
Link, Hobart K.....GIT
Lawrence, Andrew W.....SLR
Lewis, James Clifford.....SLR; CSO
Luster, Clifton H.....FLR
Lee, John Francis, Jr.....SLR; GLC
Lewis, James L., Jr.....SLR; AGC
Lockwood, Milton K.....SLR; AGC
Lane, Leroy Clarence.....SLR; GLC
Leonard, J. Cecil.....FRF
Longan, Edwin D.....FLR; CMV
La Vie, George Andrew, Jr.....SLR; GIT
Lenihan, Thomas J.....FRF
Landreth, Robert M.....AAD; MIT
Lake, Chester Harrison.....SLR; GIT
Lewis, Walter E.....UTA
Loudenbach, M. V.....UTA
Law, Bernard A.....FRF
Logg, David .....FRF
Leverich, Pierce B.....SLR; OSU
Ludick, Roy E.....HHN
Littel, Gregory Barrett.....FLR; CSO
Love, Homer B.....FLR; KST
Latimer, Charles W.....CPR; VBW
Lawson, Lawrence A.....SLR; FOB
Lawton, Mortimer Powell.....SLR; FOB
L'Ehmann, Chester Leon.....SLR; OSU
Lehmann, Henry P.....SLR; GIT
Lindorff, Theodore J.....SLR; HHN

M

Mitchell, Orion L.....FRF
McGill, Robert B.....FRF
Marsh, William Alexander.....SLR; CWT
Merrill, Charles E.....UTA
Macaulay, Charles H.....UTA
Mann, Donald S.....UTA
Miller, Milo H.....FRF
McDonald, Earl .....FRF
McCullough, Charles B.....FRF
Meloy, Vincent J.....FRF
McAyeal, James A.....FRF
McKee, Frank Morton.....SLR; FOB
Marshall, Robert J.....SLR; FOB
Mackenzie, Kenneth .....FLR; CGC
Mayo, Edward Hansen.....FLR; CSO
Mahoney, William Louis.....SLR; MIT
McCutcheon, Mack D.....SLR; FOB
McDonough, Charles Julius.....FLR; CGC
Makepeace, Frank Barrows, Jr.....CPR; CSO
Maynz, Theodore .....FLR; EHT
Mills, Charles F.....SLR; THT
Morris, Roy Kelly.....SLR; EHT
McDuffee, William Summer.....SLR; EHT
Miller, Roy Gilman.....SLR; EHT
McKee, John R.....SLR; HHN
McEachran, Wilbur Hugh.....SLR; GLC
McLaughlin, Oscar F.....SLR; FOB
McQueen, Bruce Alexander.....SLR; FOB
MacLachlen, Lynn R.....SLR
Mayforth, Harold A.....SLR
McClurg, Leslie J.....SLR
Meyer, Howard J.....SLR
Murphy, John J.....OSU
Markham, John A.....OSU
Markel, Charles Hill.....SLR; EHT
Malone, Gilbert .....SLR; GLC
Millard, Jesse Charles.....SLR; GLC
May, Russel V.....CPR
McGinty, Leonard D.....FLR
McNabb, David W.....FLR
Montgomery, Roger .....FLR
Monahan, Tom Keena.....SLR; KST
McCloy, Dixon E.....FLR; KST
McMurphy, Russell V.....FLR; KST
Milliken, Martin H.....FLR; KST
Mote, Sharon R.....FLR; KST
Myers, Joseph A.....FLR; KST
Meadows, Asbury W.....FRF
Merriman, Frederic .....SLR; WDO
Morton, Quin .....SLR; WDO
McCue, John Bernard.....SLR; GLC
McCart, John L.....FRF
Meacham, Jerome F. Burnett.....SLR; GIT
McLafferty, Joel Edward.....SLR; FOB
Menefee, Jesse I.....FRF
McKeon, George J.....UTA
Mayhew, Harry E.....GIT
Murphy, James M.....MIT
Makielski, Stanley J.....MIT
McCaffrey, James Rorke.....SLR; GLC
Magill, William Leslie.....SLR; GLC
MacNaughton, John E.....SLR; GIT
Marrs, Aubrey R.....CUI
Meens, Gardiner C.....CUI
Maffett, John Thompson.....FLR; AGC
Marlowe, Edmund P.....FLR; AGC
Mayhew, Zeb .....SLR; GIT
Myers, Devereus Maitland.....SLR; GLC
Mather, Carl Spencer.....SLR; EHT
Morse, Guy E.....SLR; AGC
Mulherin, John H.....SLR; AGC
McFarland, Denman T.....SLR; AGC

N

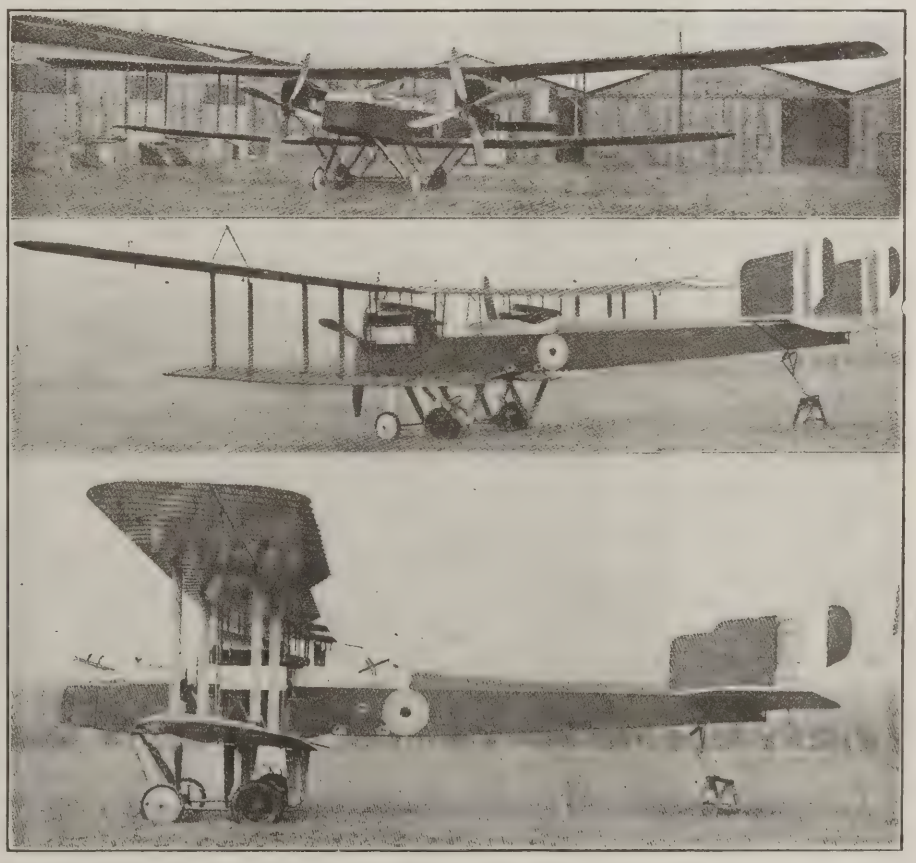
Nason, Walter Hooker.....SLR; CSO
Nagle, Frank Lincoln, Jr.....CPR; KST
Nash, Samuel S., Jr.....UTA
Neubig, Earl E.....FRF
Neubauer, A. J.....CPR; KST
Niles, Edward Abbe.....SLR; EHT
Nathan, Joseph H., Jr.....SLR
Nichols, Harrod A.....SLR
Nichols, Joseph F.....CPR; KST
Niday, Hugh D.....FLR; KST
Norris, Howard Dutton.....SLR; GLC
Norton, Fred W.....FRF

O

Orbison, Douglas C.....UTA
O'Toole, Hubert M.....UTA
O'Connor, Charles J.....CPR; CGC
Oler, Wesley Marion, Jr.....SLR; GLC
O'Brien, Matthew Houston.....SLR; EHT
Ohrstrom, George Lewis.....SLR; EHT
O'Neil, James Joseph.....SLR; EHT
O'Daniel, James A.....SLR; AGC

P

Parish, Hayward Carroll.....SLR; KST
Pernot, Frederick Eugene.....CPR; CSO
Page, Richard Marshall.....SLR; CSO
Plettner, Walter Edward.....SLR; KST
Parsons, Jay Hamilton.....SLR; EHT
Patterson, Fred Roby.....SLR; FOB
Powers, Ernest A.....FLR; KST
Penny, James J.....SLR; HHN
Palmer, William Eagle.....FLR; KST
Parker, Walter Harriman.....FLR; CMV
Preston, Lewis B.....CPR; CSO
Palmer, George M.....FRF
Pope, Harley H.....FRF
Powers, Leo F.....FRF
Porter, Kenneth L.....FRF
Patrick, John B.....UTA
Pierce, Hugh M.....CWT
Pendleton, James D.....FRF
Peterson, Luther C.....SLR
Pfizenmayer, George .....SLR
Pardee, Charles M.....OSU
Parsons, Charles .....OSU
Phillips, Donavan R.....FLR
Penny, Thomas, Jr.....SLR; KST
Pierce, Arthur H.....FLR; KST
Prophet, Wilson B.....FLR; KST
Pond, Thomas W.....SLR; AGC
Peyton, Harry Lamar .....SLR; KST
Patten, Ryder .....FLR



Fairey Aviation Company's Twin-motored Folding Wing Biplane designed in 1914, built in 1916.

St. Paul, John, Jr.....UTA
Pickrell, Floyd M.....FRF
Palmer, Burdette Allan.....SLR; WDO
Putnam, Marion G.....CPR; MIT
Proctor, Charles Albert.....CPR; CSO
Pauly, Charles Warren.....FRF
Pavesich, Francis Xavier.....SLR; GLC
Peddycoart, Clinton Merrill.....SLR; GLC
Pell, Clarence Cecil.....SLR; KST
Palmer, Millwood Jonah.....SLR; KST
Powell, John William.....SLR; KST
Price, Harlow Russell.....SLR; GLC
Prattt, George H.....SLR
Pascoe, William H.....SLR
Paul, Frank M.....SLR
Payne, Owen S.....SLR
Peabody, Burton W.....SLR
Peterson, Harold G.....SLR
Power, Hugh C.....SLR
Pratt, Weldon G.....SLR

Q

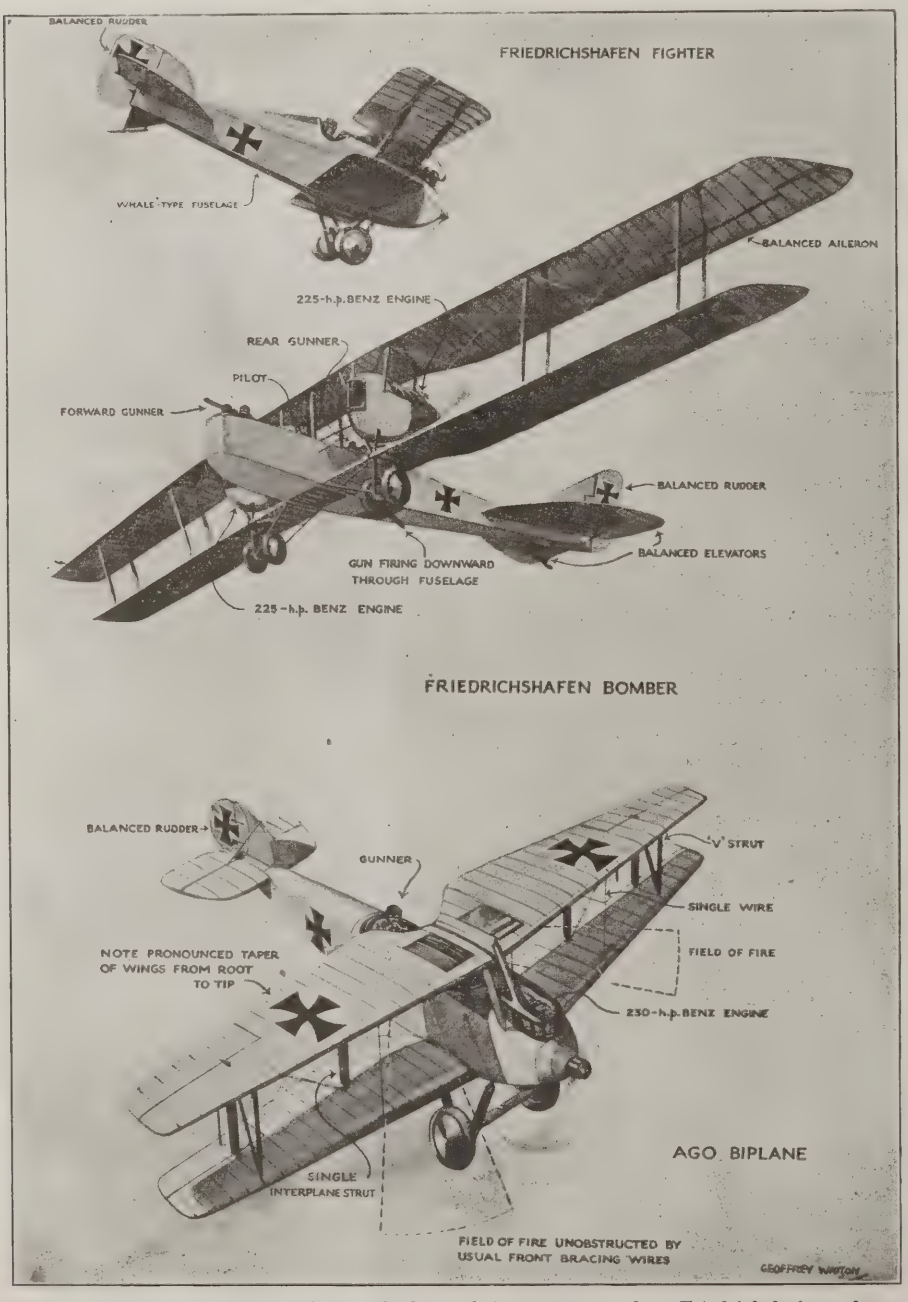
Quakenbush, Leo D.....SLR
Quinius, Edward P.....FLR

R

Richardson, James Monroe.....SLR; GLC
Rahn, John Chris.....SLR; FOB
Reed, Maurice J.....SLR
Reilly, Lloyd G. E.....SLR
Ridling, Little .....SLR; EHT
Roberts, William Roderic.....SLR; GLC
Ravenscroft, Charles F.....FLR
Reiff, Marion O.....FLR
Riley, Paul G.....FLR
Ramsey, George B.....FLR; KST
Reid, Barton S.....FLR; KST
Reusch, Louis, Jr.....FLR; KST
Reymiller, John L.....FLR; KST
Rotholz, Max B.....SLR
Regan, John A.....CUI
Richardson, James G.....FLR
Reitenbaugh, John Smith.....SLR; GLC
Reed, William Gardner.....CPR; CSO
Ramsey, Lawrence .....DIS
Rust, Charles E.....SLR; AGC
Ramsey, William W.....SLR; AGC
Rice, B. N. H.....SLR; AGC
Reilly, Frank D.....SLR; AGC
Richardson, John Samuel.....SLR; AGC
Ray, Luke C.....MIT
Rollins, James F.....FLR; AGC
Ramsey, G. Baxter.....FLR
Ray, Luke C.....SLR
Riseman, Joseph .....SLR; GIT
Richardson, Edward Hart.....SLR; GLC
Raley, Edward E.....FRF
Randolph, William M.....UTA
Rouse, Thomas L.....FRF
Rodgers, Henry .....MAJ; FOB
Renwick, Ralph .....SLR; CMV
Raynolds, John Fiske.....FLR; MIT
Rath, Joseph M.....SLR; OSU
Richardson, Tracy .....CPR; CSO
Rowell, Wallace A.....FRF
Ridley, Oscar Thomas.....SLR; EHT
Rule, William Glenn.....SLR; KST
Roane, James Fant.....SLR; EHT

S

Sage, Edward W.....UTA
Sloan, Edward C.....UTA
Schapiro, Jacob .....FLR; CSO
Smith, Claude Benton.....SLR; KST



Salient features of German machines which are being constructed at Friedrichshafen, where Zeppelins were made. (Courtesy London Illustrated News.)

Schenck, P. D.....REL
Simmons, John A.....UTA
Squires, Cameron .....SLR; VBW
Sigler, Melverne W.....CPR; KST
Stoeckel, Joseph F., Jr.....UTA
Stenberg, Thornton R.....UTA
Scott, Grant Elbert.....SLR; GLC
Sawyer, George W.....SLR; GLC
Shepherd, Robert A.....UTA
Russ, Flenn F.....FRF
Schoepf, Alfred Walter.....SLR; MIT
Servis, John H.....FLR; OSU
Stewart, Roger E.....SLR; KST
Simms, Ira R.....UTA
Shortley, Michael J.....UTA
Smith, Edgar H.....UTA
Schroeder, John William.....SLR; KST
Stevens, Albert William.....FLR; CUI
Symons, William Leonard.....CPR; CSO
Sutton, Harry A.....FRF
Scott, George .....FLR; CSO
Slayton, Robert E.....UTA
Stafford, Seymour S.....SLR; GIT
Smith, Paul A.....FRF
Seward, Howard Holland.....SLR; THT
Smith, Horace Jeremiah.....SLR; THT
Simpson, John Milton.....SLR; EHT
Simon, Gerald H.....SLR; HHN
Squier, Merrill Armstrong.....SLR; GLC
Sherrick, John C.....SLC
Shuss, Pressley B.....SLR
Smith, Leo A.....SLR
Spencer, Earl B.....SLR
Spinney, Byron H.....SLR
Stewart, Eugene .....SLR
Scott, Eli T.....OSU
Syrcher, Edward V.....OSU
Stafford, Fred W.....OSU
Surber, Wilfred A.....OSU
Seitz, George H.....FLR
Sheldon, Vernon C.....FLR
Smith, Ralph G.....FLR
Stanley, Frank J.....FLR
Scribner, Carleton Spear.....SLR; KST
Slattery, Frank Earl.....SLR; KST
Steward, Lewis Hollister.....SLR; KST
Sanford, John D.....FLR; KST
Severin, Shirley .....FLR; KST
Shaffer, James H.....FLR; KST
Smith, William D.....FLR; KST
Stevenson, William F.....FLR; KST
Shaffer, William D.....FLR; KST
Sanborne, Paul Fitch.....SLR; GLC
Smith, Albert Herman.....SLR; GLC
Sutton, Sherwood .....SLR; GLC
Shaw, Edward Prehle.....SLR; GIT
Shafer, Maurice S.....SLR
Shannon, Torrence T.....SLR; SBI
Sharpnack, Torrence T.....FRF

T

Truello, Adam .....ELA
Treleaven, Peter W.....UTA
Tommers, Andrew Edward B.....SLR; GLC
Tuten, James A.....SLR; KST
Thomas, Walter G.....DIS
Taylor, Herchel R.....FLR; OSU
Thomas, Hayward Charles.....SLR; RWT
Tilney, John Mason.....SLR; THT
Thomas, Charles Signor, Jr.....SLR; EHT
Teichman, Herbert Henry.....SLR; GLC
Thorn, Robert M.....SLR; THT
Thompson, Harlan .....CSU
Toms, Raymond E.....CPR
Tallmadge, Alvan B.....CPR
Tabor, Aubrey H.....FLR
Templeton, Howard J.....FLR; KST

U

Urband, Edward M.....SLR
Upston, John E.....SLR; GIT

V

Van Deventer, Augustus, Jr.....OSU
Vandenberg, Byron F., Jr.....AAD; CSO
Vogel, Harry J.....FLT; OSU
Vandervort, Henry C.....SLR; THT

W

Wilkinson, Arthur H.....OSU
Wilson, Elbert E.....SLR
Wisegarver, George E.....SLR
Wright, William E.....SLR
Wiedemann, Duncan Ray.....SLR; EHT
Walsh, Eugene .....FLR
Webster, Thomas J.....FLR
Whitsitt, Vincent P.....FLR
Wiley, Barton L.....FLR
Wilson, Guy A.....FLR; KST
Williams, James G.....FLR
Warber, Frederick P.....FLR; KST
Whitehead, Cecil F.....FLR; KST
Wight, Rupert A.....FLR; KST
Wiley, Harrison S.....FLR; KST
Wettengel, Everett B.....FLR; KST
Wiegand, Edmund A.....FLR; KST
Whaler, Charles E.....UTA
Williams, Edward L., Jr.....FRF
Williams, Donald Blaine.....CPR; AGC
White, Henry C.....CPR; FOB
Whitney, Reginald W.....FRF
Ward, Charles L.....UTA
Waite, Walter Edward.....FLR; GIT
Willis, Henry Percy.....SLR; CSO
Whitehouse, Charles E.....FRF
Weaver, Lowell K.....FRF
Warfield, Richard E.....FLR; MIT
Wylie, Laurence .....SLR; PFO
Watkins, Kenneth .....SLR; CMV

(*Continued on page* 1169)

SKY FIGHTERS OF FRANCE

THE French official exhibition of paintings of battles in the air by Lieut. Henry Farré, Paintre Official des Ministers de la Guerre at Marine, and films of latest Aerial Warfare will be shown at the Anderson Galleries, Park Avenue and 59th Street, from March 10 to March 20, inclusive.

There will also be on view, during the period of the exhibition, together with bombs and other weapons of aerial warfare, the actual aeroplane, called familiarly by the French, "Le Vieux Charles" (Old Charlie) in which Captain Guynemer, the famous French Ace, recently killed in action, fought many of his daring air battles, and from which he sent to earth many of his eighty-four German aeroplanes, fifty-five of which stand as his official record.

A special opening, or "Vernissage" will be held at the Anderson Galleries, Saturday afternoon, March 9, at 3:30 o'clock, at which Governor Whitman will officially and formally open the exhibition. There will also be present on this occasion, in addition to the members of the French Military Mission to United States, Representatives of the French Ministry, and many of the noted French aviators stationed near New York and in Washington.

Tickets for this occasion, and for all other days, may be obtained by application to the Anderson Galleries, Park Avenue and 59th Street, New York, or to any member of the Executive Committee.

Committee of Honor

His Excellence, Ambassador Juserand; André Tardieu, French High Commissioner; Marquis Melchior de Polignac, Major-General George O. Squier, Chief Signal Officer; Hon. Howard E. Coffin, Chairman, Aircraft Board; Colonel E. A. Deeds, Member, Aircraft Board; Colonel Montgomery, Member, Aircraft Board; Colonel Charles E. Lee, British Royal Flying Corps; Commandant Tulasne.

Executive Committee

Mrs. William A. Chanler, Chairman; Commandant Tulasne, Mrs. Edmund L. Baylies, Mrs. John Magee, Mrs. Walter E. Maynard, Mr. Frank Crowninshield, Baron Charles Huard, Lieutenant Henri Farré, Mr. Alan Hawley, Mr. Henry Woodhouse, Mr. Walter E. Maynard, Treasurer.

National Committee

Mr. Edwin Alderman, President of University of Virginia; Hon. Robert Bacon, Mrs. William Allen Bartlett, Chairman, Aviation Committee, National Special Aid Society; Mr. George Gordon Battle, Hon. James M. Beck, Mr. Edwin Blashfield, Mrs. William H. Bliss, Mr. Louis Boissevain, Mr. Adolphe Borie, Mr. I. Tucker Burr, Mr. Walter Camp, Miss Alice Carpenter, Chairman, New York Branch, Woman's Naval Service; Mr. J. Parke Channing, Chairman of the Engineers' Council; Mr. Frederic R. Coudert, Mr. William H. Crocker, Miss Marjorie Çurtis, Mrs. Henry P. Davison, Mr. Henry J. Davison, Mrs. William Adams Delano, Mr. Edgar B. Downs, Chairman, National Defense Committee of the Rubber Committee of America; Mr. Morton B. Downs, Duchesse de Chaulnes, Mr. Finley Peter Dunne, Mrs. Newbold LeRoy Edgar, Mr. Charles E. Eliot, Mr. J. B. W. Gardiner, Mrs. Charles Dana Gibson, Mrs. Jay Gould, Mrs. F. Gray Griswold, Mrs. John Hays Hammond, Jr., Mrs. E. H. Harriman, Mr. Thomas Hastings, Mr. McDougall Hawkes, Mrs. Ernest Iselin, Mrs. Lewis Iselin, Mrs. Cadwalader Jones, Mrs. Otto H. Kahn, Dr. George F. Kuntz, Mr. Thomas W. Lamont, Mrs. Lewis Cass Ledyard, Hon. G. Liebert, French Consul; Mr. I. Chauncey McKeever, Mr. Eugene Meyer, Jr., Council of National Defense; Hon. Geo. Von L. Meyer, Mr. Edwin G. Merrill, Mr. William Fellowes Morgan, Mr. Chas. A. Munn, Mr. Frank A. Munsey, Mr. Alfonso de Navarre, Prof. Henry Fairchild Osborn, Rear Admiral Robert E. Peary, President, Aerial League of America; Marquis de Polignac, Mr. Augustus Post, Mrs. Ralph Pulitzer, Mr. William Reick, Mrs. Charles Van Rensellaer, Chairman, National Aeronautic Committee, Woman's Naval Service; Mrs. Schuyler Van Rensselaer, Mrs. Douglas Robinson, Mr. Charles H. Sabin, Mr. Charles Scribner, Mrs. W. D. Sloane, Mrs. Willard Straight, Mrs. Herbert Bayard Swope, Mr. Benjamin Thaw, Mrs. William Payne Thompson, Mr. A. Kinnaird Tod, Mr. Bennett E. Tousley, Mr. Charles Hanson Towne, Mrs. Cornelius Vanderbilt, Mrs. Fiske Warren, Mr. Lloyd Warren, Mr. Charles Whetmore, Mr. Henry J. Whigwam, Hon. Henry White, Hon. Charles S. Whitman, Governor of the State of New York; Mrs. Charles S. Whitman, Mr. Louis Wiley, Mrs. M. Orme Wilson, Mr. Bronson Winthrop, Mrs. Henry A. Wise Wood, Chairman, National Aeronautic Committee, Woman's Naval Service.

(*Continued on page* 1168)



One of the 140 Official French paintings of Lieut. Henri Farré which are to be exhibited at Anderson Galleries, 59th street and Park avenue, New York City, March 10 to March 20.

CARBURANTS AND LUBRICANTS FOR AVIATION

By DR. UMBERTO POMILIO*

AVIATION motors, although vastly different in form, can all be grouped under the one type of explosion motor with benzine vapor. The good working and a high efficiency of such a machine is greatly increased by the scientific choice of good carburants and lubricants. To the study of these substances, to the examination, analysis and control of their requisites, this chapter is dedicated.

Carburants are those combustible liquids which, after a preliminary evaporization and mixing with air in the carbureters, are admitted to the combustion chamber and are burnt at the right moment.

The combustion is complete, instantaneous and furnishes gaseous products at high temperatures and therefore at high pressures. The simultaneous presence of these causes, has the resultant effect of an explosion which produces mechanical action which the motor partly transforms in useful work.

From an initial phenomenon of combustion or chemical—we pass step by step to that of final mechanical work. This is stickly dependant on the first. This is why the gasoline

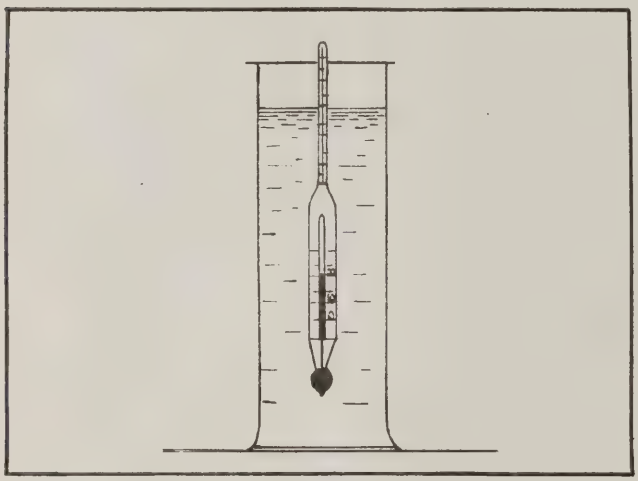


Fig. 1—Densimeter or aerometer.

plays such an important part on the power developed by a motor. The carburant which has been adopted in aviation is the *"aviation gasoline,"* which really is nothing else than very pure automobile benzine which is obtained from an accurate refining of the raw benzine originally obtained from the factional distillation of kerosene. (raw petrol.)

As in the aviation motor we need a *high power per unit weight of* the gasoline, so for aviation benzine we prefer those, that everything else equal, will give the highest calorimetric effect per unit weight; but *the thermal efficiency of benzine increases with its purity* (degree of refinement) and therefore only the most refined products are used for aviation purposes. Very pure benzine is colorless even when in large quantity, it has a very slight characteristic odor, and must dissolve in pure alcohol.

Mixed with concentrated sulphuric acid must not change its color, mixed with pure tepid water must not give an acid or alcaline reaction. (The former noticeable by the orange color turning red with acids by adding a few drops of acqueous neutral solution of methilorange; the latter with colorless alcohol solution of phenalphtailene which becomes purple with alcali.)

Even benzines of ordinary quality do not contain water; but if water were mixed with it the benzines would become opalescent.

A few drops of benzine when evaporated on porous paper must not leave grease spots or odor (heavy oils). A refined aviation benzine must boil within very narrow limits; too volatile fraction (ethers of petroleum) would give it an excessive facility of explosion and therefore little safety in handling; non-volatile fractions (tar benzine, ligroine, petroline) would not evaporate well in the carbureter. As it is difficult to determine the precise boiling points it is found more convenient to substitute for this the test for density or specific weight which can give an idea of the fractions which are present; however strick relations between density and volatility may not exist. Benzines distilled from petroleums which come from different localities, even though they may have the same densities, may result to be formed of fractions with different volatility limits.

As the density varies according to the temperature it is usual to refer to a constant temperature of 15° C; the results of density found for other temperatures, can be changed to the normal value of 15° C by adding or subtracting so many times 0.0008 multiplied by the degrees above or below 15° C given by a thermometer during the test.

The densimeter or aerometer is used in practice, an instrument easily handled, which when immersed in the benzine gives a direct reading of the density by reading the mark at the level of the liquid. (Fig. 1).

Since to know the normal value (reduced to 15°), it is necessary to know the temperature, it has been found convenient to use a densimeter which has a thermometer attached to it; such an instrument if exactly calibrated will give excellent results. Before reading the temperature it is well to let the thermometer be immersed in the liquid for at least five minutes. Aviation benzine is, at very low temperatures, an inflammable liquid and gives vapors which when mixed to the air will make explosive mixtures. The air will become explosive when it contains benzine vapors between the limits of 2.5 per cent to 4.8 per cent; this range of explosion seems very limited but it can be seen that with very small quantities of benzine vapor the danger of explosion is great therefore great carefulness must always be used in handling this liquid.

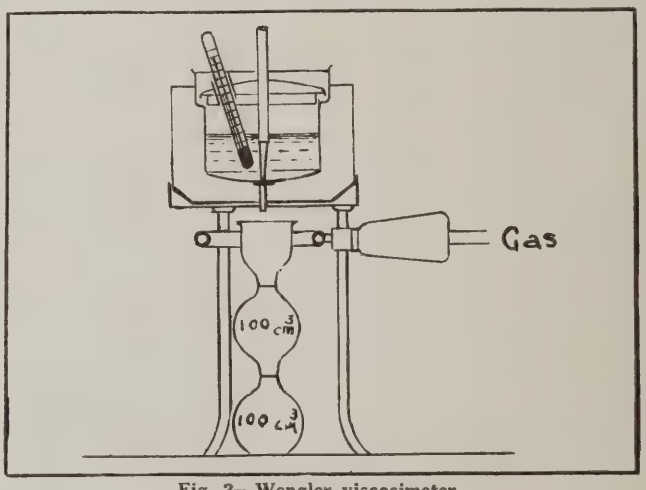


Fig. 2—Wengler viscosimeter.

Below is given a table which can give the *specifications required of a good aviation benzine:*

Boiling point	Density 15° C	Heat of combustion	Inflamability Temperature	Colorless, odorless, absolute absence of acid and heavy oils, tar and essence of turpentine
Betw 80° C- 100° C	From 670 to 695	Not less than 11,000 calories	Between 3 C	

The above mentioned limits of density—and the density is that property of most interest in the control of benzine—are not very far away from those of a good automobile benzine; for example the Deutsche Automobile Club give a good automobile benzine as one having a density of 15° C from 0.68 - 0.700.

Lubricants

Only part of the mechanical energy produced by the explosion is transformed in use work; the rest is absorbed by the passive resistances and by friction; if it were possible to do away with these resistances all the mechanical energy could be utilized for work. In practice we must be satisfied with coming as near as possible to this theoretical limit by reducing the frictional resistances to a minimum; for this purpose lubricants are used which substitute their small frictional

*By courtesy of Aeronautical Aunnary of Italian Touring Club.

resistance between the metal parts in motion and in direct contact in the machines whose resistance is much greater, and in the same time avoiding the heating and the wear which would result from the rubbing of solid surfaces.

The more the lubricant answers these specifications—for a given pressure, velocity and temperatures of the moving parts—the better it is. A good lubricant must not evaporate, must not dry up, nor have any corrosive action.

Aviation motors are lubricated with the same mineral oils used for automobiles (much purer however) and also with castor oil, a vegetable oil which in this respect has come to be of great importance.

The mineral oils—residue of that same petroleum which gives aviation benzine—are in the market in the greatly different qualities; are preferable those which although being good lubricants are devoided of extraneous substances, either harmful or of less value through adulteration, or not derived from the petroleum or which have been absorbed during the process of refinement of the same.

Color usually does not give a sure base to go by; but the lighter oils are usualy the more refined. The oil must not have any substance in suspension, and must be limpid; turpidness is derived from presence of paraphine or water; this last substance is harmful and is easily discovered by heating the oil to 50°-60° C, if the oil becomes limpid it contains paraphine, but if it stays turpid water is present and the only way to get rid of it is to heat the oil for a long time at a higher temperature than 100° C; if after this operation the oil, after cooling remains turbid it means that paraphine was also present; this however is not harmful. Free mineral acids (usually sulphuric acid absorbed during refinement) and alcaline substances which are very harmful are discovered by mixing the oil with hot water and testing it as for the carburants.

Density canot be relied upon; it is given to help classifying or identifying an oil. At high temperatures oils will give vapors which are inflammable, or even take fire in mass. This lighting in a motor while operating may be highly dangerous. Good aviation oils *ought to resist temperatures higher than* 200° C. For the test, the oil is slowly heated in a porcelain crucible and a flame is brought near it at intervals. In this way we come to a temperature—read on a thermometer which is immersed in the oil—when the flame produces a small explosion due to vapors given out from the oil; this temperature is called inflammability, keeping on heating the oil we come to a temperature which will make the oil burn constantly; this is the lighting temperature.

More accurate measurements are taken with an apparatus—the Penshy Martens—which is not difficult to use.

The most important characteristic of an oil, however, is its viscosity or internal resistance. Experience shows in moving machines the friction between the lubricated parts and the lubricant (external resistance) is negligible compared to that in the lubricant itself between its moving molecules (internal resistance or viscosity). Best adapted as lubricant would seem to be those having the least viscosity but, on the other hand, the moving pieces in a machine having a large friction will tend—especially at high temperatures, to throw out and squeeze out the lubricant which wets them, and if this has not a high adhesive force it is easily thrown out.

The adhesive force increases with the viscosity of the oil; this is the reason why viscous oils are adapted better than the non-viscous for an efficient lubrications of the parts.

In reality, for certain rotating parts under pressure with given speeds and temperatures only lubricants with a viscosity within certain definite limits are used. In practice, rather than the absolute viscosity, it is enough to know the relative viscosity of certain oils, and this is determined by the Engler apparatus. Fig. 2.

In the Engler viscosimeter we compare the time that, for given temperatiures, fixed volumes of different oils will take to flow from the measuring vessel. The quotient between these times in seconds and that taken by an equal quantity of water at 20° C. flows from the Engler apparatus at a rate of 5.5 greater than the same volume of water at 20° C. It is always useful to take measurements of viscosity at different temperatures, and in accepting oils it is advisable to specify the values of viscosity desired at high temperatures; because good oil must keep a good even viscosity even at high temperatures and those that become too fluid at high temperature should be discarded.

A high viscosty at ordinary temperatures can be obtained with foreign substances (resin soaps, and the oil, beside being not adapted for the purpose for which it is to be used, may be dangerous. Resin which contains a large quantity of organic acids attacks, when heated, the metallic parts; it is discovered by heating the oil with alcohol and evaporating it after having separated it from the only strata; a resinous residue shows the presence of resin.

Soaps, which easily give out alcalic, give a lather when the oil is shaken with water, and oily emulsion is also formed which gives an abcalic reaction. Cautchu is not vulcanized, if added in small quantities increases the viscosity, and it is not harmful; oils, which contain cautchu, threads.

We have already said that mineral oils used for automobile engines can be used, if very pure, for aeroplane motors. In practice specifications for aviation oils have not been exactly established; they are based on those for automobile oils.

This is what the German Military authorities want for

	Viscosity in degrees Engler 20°C	50°C	Specific Weight	Freez. point	Acid Content	Inflam. Point	Remarks
Heavy oils for automobile combustion engines (for summer)	from 42 to 80	from 7 to 11	880/ 940	—	0,00	210°	Light color & transparent. It must only be mineral oil.
Fluid oils for same motors (winter)	from 20 to 42	from 4 to 7	870/ 940	-12	0,00	1950	

For the special lubrication of the cylinder we must have the following specifications

	Viscosity 20°C	Degrees E 50°C	Acid Content	Inflammability Point in closed apparatus (Penshy Martens
Heavy oil for cylinders of internal combustion engine	20-85	4.4-10.8	0.01	185—215

A good mineral oil for cylinders is difficult to find; furthermore, the oils which lubricate the other machine pieces are forced in the cylinders, especially in the rotary engines, here they are incompletely burnt and produce motor troubles.

. *Castor Oil.*—Is a vegetable oil extracted from the seed of the ricinus communis. It has been found to be very good, especially for lubricating rotary motors.

Castor oil has a very high viscosity, a very good requisite for lubricants of rotary motors. The parts lubricated with this oil are heated less than if made with other oils; this has been explained in different ways.

Castor oil burns completely when the mixture of gas is exploded, the strata of tar which makes the movement of the piston more difficult, thereby rendering difficult the smooth operation of the machine.

A good castor oil will have the following specifications: Density at 15° about 0.790.—freezing point, 153° C.—viscosity (D. E.) at 20° C. from 140-150; it should mix with 95% pure alcohol in all proportions, but must not dissolve in benzine nor in petroleum ether.



A school for training mechanics for the French air service. French Official Photo

THE PRINCIPLES OF RANGE FINDERS AND BOMB SIGHTS FOR AIRCRAFT

By C. LEVICK*

THE "Goerz" range-finder (described in AERIAL AGE of August 27, 1917) opens up an immense field for these and similar apparatus, the general elementary principles of which it is proposed to ventilate. Their use, of course, is to find the exact moment, or rather position, at which a bomb must be released to hit any desired target. It is well known that bombs must be fired before the machine is perpendicularly over the target, but it is not so clear that the exact position depends *only* upon the height above the target, and the velocity of the bomb, *i. e.*, the velocity of the machine relative to the ground—this assumption, of course, excludes effects of wind, air resistance, and many other minor conditions, some of which are exceedingly difficult, if not impossible, to deal with, and are therefore, for the purposes of this paper, ignored.

Suppose in Fig. 1 an aeroplane at A wishes to drop bombs on a building at C, also that it is travelling at v miles per hour, and at h feet above target. From elementary mechanical principles, and Newton's Laws, the bomb when released at A will move along a parabolic curve, $A\ P\ C$, and the time t seconds taken to fall through h feet will equal the time taken to travel s feet—the horizontal distance the machine is from the target C. Now if A is the correct point for release, we can find from the above particulars, the angle $\theta°$, which will enable us eventually to know exactly when to drop the bomb.

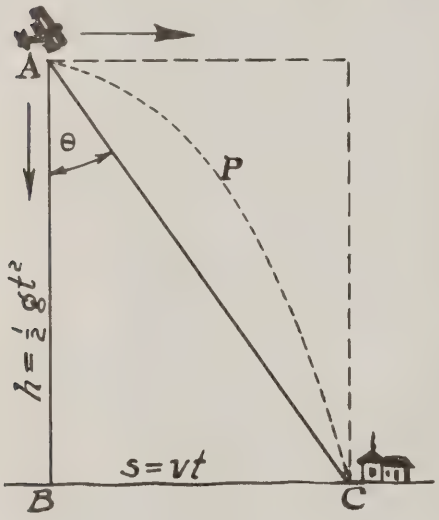


Fig. 1.

For—

$$\tan\theta = \frac{s}{h} = \frac{vt}{\frac{1}{2}gt^2} = \frac{2v}{gt}$$

$$\therefore \theta = \tan^{-1}\left(\frac{2v}{gt}\right)$$

But $h = \frac{1}{2}gt^2 \quad \therefore t^2 = \left(\frac{2h}{g}\right)$

and $t = \sqrt{\frac{2h}{g}}$

And substituting—

$$\theta = \tan^{-1}\left(\frac{2v}{g\sqrt{\frac{2h}{g}}}\right)$$

If v is in miles per hour and g taken as 32.2 f.s.s.—

$$\theta = \tan^{-1}\left(\frac{\frac{2\times 88}{60}\cdot v}{32.2\sqrt{\frac{2h}{32.2}}}\right)$$

$$\theta = \tan^{-1}\left(0.366\,\frac{v}{\sqrt{h}}\right) \qquad (a)$$

This equation contains only two unknowns, v and h, hence the point A is known when the height and velocity of machine are known; the sighting apparatus is set beforehand to the angle θ, which causes the target to appear in sights when machine is at A.

In actual practice, the values of h and v are subject to considerable variations, and are not easy to find. The aneroid barometer, at present, has to be relied upon for h, the height of target above sea level being deducted from height of machine above sea level read. In a deliberately planned raid, this is a simple matter with a good contour map. The value of v is much more difficult to find, owing chiefly to effects of the wind, which not only reduces or increases speed of aeroplane, but continues to act on bomb when falling, causing it to deviate from the theoretical—and easily calculated—path. The method used on the "Gothas" with the "Goerz sighter" is ingenious, and deserves much attention and many practical trials. It is explained below.

To obtain the actual velocity of aeroplane relative to the earth, sight an object in line of flight through sight tube and time it from the moment when sighted to the moment when vertically underneath, measuring the angle turned through by the tube. In Fig. 2, let

h = height of machine in feet.
s = horizontal distance between machine and object in feet.
ϕ = angle in degrees which tube turns through.
v = velocity of machine relative to earth in m.p.h.
t = time taken in seconds.

Then $$v = \frac{s}{t} \times \frac{60}{88}$$

But $$s = h\tan\phi.$$

$$\therefore v = \frac{60}{88}\cdot\frac{h\tan\phi}{t}$$

$$= 0.682\ .\ \frac{h\tan\phi}{t}$$

If a standard angle of 36° 10′ were always taken for ϕ, we have:—

$$v = 0.682 \times \frac{h \times 0.734}{t}$$

$$\therefore v = \frac{h}{2t} \qquad (b)$$

The difficulty of filling in and working out the values of equations (a) and (b) with different sets of values can be got rid of either by using a graph, a table, or a slide rule. It is not difficult to arrange a slide rule on which the unknowns can be read instantly with one setting. The latter method has the advantage—if its use is practicable when flying—that *any* combination of the unknowns can be solved instantly!

The principle of a suitable ruler is the same as that of the standard Mannheim type. The scales are arranged as in Figs. 3 and 4 on the front and back face respectively.

Front face for solving $\theta = \tan^{-1}\left(0.366\,\frac{v}{\sqrt{h}}\right)$

Scale A on bottom edge of top strip of ruler is a scale of degrees.

Scale B on bottom edge of middle strip of ruler—the slide—is a scale of heights in feet.

Scale C on top edge of bottom strip of ruler is a scale of velocities in m.p.h.

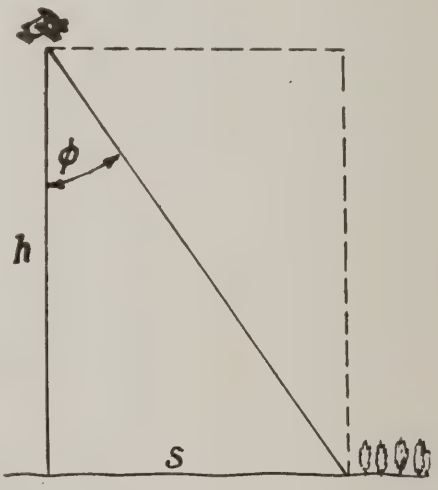


Fig. 2.

To work ruler, suppose for example:—
v = 90 m.p.h. and h = 2,000 feet.

Then $\theta = \tan^{-1}\left(.366\,\frac{v}{\sqrt{h}}\right) = \tan^{-1}\left(.366\,\frac{90}{\sqrt{2000}}\right)$

To v, *i. e.* 90 on scale C, set h, *i. e.* 2,000 on scale B, and read $\theta°$ over index on scale A. $\theta = 36\frac{1}{2}°$ approx.

The method of calibrating the rule is as follows. Scale B is half the length of C, and therefore the heights, although marked as h feet, represent actually $\sqrt{h}$ feet. The first operation therefore divides v by $\sqrt{h}$. The multiplication of this fraction by factor .366 is done by placing scale A—before being marked into degrees—.366 units to the left.

Back face, for solving $\phi = \frac{h}{2t}$.

Scale A on bottom edge of top strip of ruler is a scale of velocities in m.p.h.

Scale B on bottom edge of middle strip of ruler—slide—is a scale of seconds.

Scale C on the top edge of bottom strip of ruler is a scale of height h in feet.

To work ruler, suppose for example:—
h = 5,100 feet and t = 30 seconds. Set 30 on

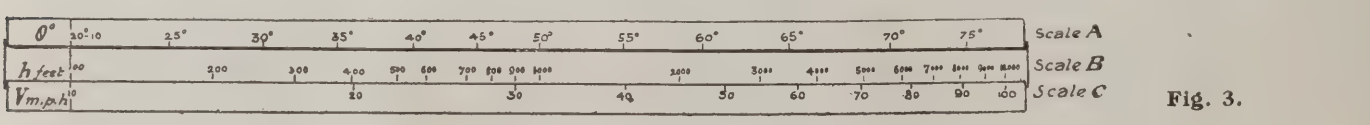


Fig. 3.

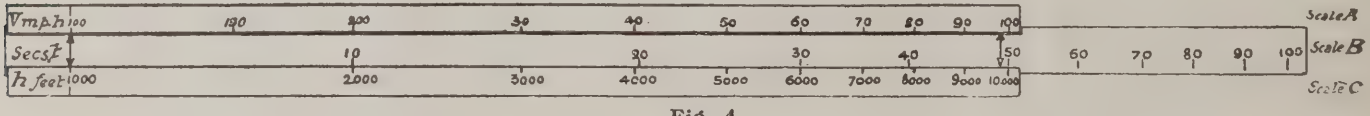


Fig. 4.

*Courtesy of *Flight*, London.

B to 5,100 on C and over index on A read 85 m.p.h.

The calibrating is executed by making all scales the same length, thus the value of $\frac{h}{t}$ in the equation $v = \frac{h}{2t}$ is given under 10 on scale B and also scale A. Division by 2 is made by placing indices .3010 units (of the slide) to left before being marked with numerals. A very suitable unit for the scales is 2 ems; this brings the total length to about 8 inches, a very convenient size.

Description of the actual sighting and dropping apparatus has been so far purposely avoided, as it is hoped that the reader has for himself, by this time, got a fair idea of their nature and functions.

No special dropping mechanism is required, but it is essential that the axes of the bombs are perpendicular to the normal flying axis of the aircraft, and immediately under the pivot of the sighting tube.

To ensure that the machine is flying in the plane of its normal flying axis, the pilot must be provided with a serviceable spirit level, placed horizontally with this plane.

The sighting apparatus must be in the nature of a telescope, capable of being rotated clockwise through 90°, *i. e.*, from horizontal to vertical position. The angle of the line of sight to the vertical—angles θ and ϕ—must be indicated on a dial or graduated ring. An alternative arrangement is the rotating prism and universally jointed sighting tube, of the "Goerz Range Finder."

For calculating the value of v it is obvious that a stop which synchronised with the turning motion of the standard angle—suggested 36° 10′—would be an advantage; otherwise it would be necessary to time the angular rotation by hand. In any case, timing mechanism must be included to complete the whole apparatus.

Here is another opportune moment to point out the field for an ingenious instrument maker. If, for instance, it were possible to read the angles θ and ϕ and the time t seconds without removing the eye from the eyepiece, it would save time and increase the accuracy of the results.

Application.—Having described generally the main details, it will be as well to follow through with the exact procedure on a deliberately planned raid. As a precaution beforehand, the state of the atmosphere is taken and approximate height of flight decided upon. From a contour map the height above sea level of objective is taken, which will be deducted from height read on aneroid some time before reaching target, thus giving value of h. The next thing to do is to calculate the value of v, to do which the pilot will first steady the machine as much as possible, keeping it flying straight ahead and in its natural flying plane. The observer will next sight a distant object in front, and keep it in view until perpendicularly under machine, recording time in seconds taken, and angle sight tube has turned through; from these values v is calculated by equation b. With this value of v angle of release θ° is calculated by equation a, and sighting tube adjusted to it and locked.

The machine will now be approaching target, which will—providing that a straight course has been kept—appear in sighting tube. This is the moment for releasing the bomb. In the "Goerz Sighter" this right and left or third motion of direction is corrected by universally jointing the range finder, and making the rotation caused by machine turning to right or left be indicated to the pilot by a sensitive electro-galvanometer. It is obvious that before it can be said how useful these apparatus will be to aviation as a science, many practical experiments must be carried out, and this together with the perfecting of the instruments and the finding out of the necessary corrections for wind and drift, are problems left to the practical man.

Fifteen Balloons "Parade"

Fifteen balloons from the Army Aeronautical School hovered over the city of San Antonio, Tex., and aeroplanes from Kelly Field went through war maneuvers, while the entire Ninetieth Division, National Army, marched in a Washington Birthday parade.

General Tozzi Describes Italian Progress

General Tozzi, the distinguished Italian military authority, in his address for the Chicago Meeting of the Society of Automotive Engineers, decried the policy of raiding Italian cities, resulting in non-military damage, and described Italy's aeronautical progress as follows:

"Long before the present war, Italy, who had already reached unhoped-for results in the automobile industry, comprehended, in common with her sister nations, the enormous importance of aviation in modern wars, and she has continued to improve her already up-to-date types as this war progressed. On the one hand she has developed and improved the reconnoitering machines which are the eyes of the army; on the other she has strained every nerve to perfect the bombing machines, and especially those for night bombing. It may be hoped that in the future, with the powerful aid of the great aerial fleet of America, these machines will be a most powerful element in the solution of battles.

"Italy, France, England and America, united by the sacred bonds of civilization and human happiness, will emphasize more and more the importance of the powerful aerial weapons, and their ability to strike the enemy rear-guards, the railroad centers, the warehouses, the munition works, and never old men, women, children, and the wounded in hospitals. Indeed the courageous French and English have already been able to shell the great industrial centres of Essen and Munich. A telling symptomatic experience was that of the daring French aviator who left one morning the French lines in Alsace, avenged at noon, by the accurate and terrifying bombing of Munich, the carnage of Padua (where enemy airships had attacked a place of refuge for the civilian population, killing over 100 women and children), and landed the same night in Venice, beloved among cities—in Venice, where he was soon to receive, with ceremonies worthy of the occasion, the Italian medal for military valor; in Venice, which he left soon after for the crowning glory in the career of a soldier, death in the performance of duty.

"At present, Italy with her Caproni machines and her Fiat engines has powerful and practical airships. And now the necessities of warfare have prompted her to establish along the peninsula fixed aerial routes, along which, with the regularity of a railroad service, there is carried on daily airship transportation from Turin and from Milan to our front, a journey of about 300 miles. We have also instituted regular air mail service between Rome and the Island of Sardinia, and between Naples and Palermo, in order to counteract the effect of the diminution of steamship service. All these routes are operated with wonderful regularity and give a vivid idea of the possible utilization of aerial routes for quick communication between nations. These are actual, if at present only sporadic, forerunners of tahe civilization of tomorrow."

Lincoln Motor Has Completed First Liberty Motor

The Lincoln Motors Co. has completed its first Liberty engines, according to "Automotive Industries." This concern has built and equipped its plant in record time, having been incorporated in August, 1917.

Weidely Motors to Enlarge

The Weidely Motor Co. has increased its preferred stock from $100,000 to $500,000 in order to provide for increased equipment and enlarged output. This company recently increased its contract with the Cleveland Tractor Co. for aeroplane and tractor motors from $3,000,000 to $20,000,000. The delivery schedule provides for 15,000 engines the first year, 25,000 the second and 30,000 the third.

Secretary Baker Confers with Aircraft Manufacturers

Secretary Baker summoned representatives of all firms constructing aircraft for the army, in order to exchange views with department officials and to make them feel that "the department is behind them."

"They all are tremendously encouraged about the work they are doing." Mr. Baker said, after the manufacturers had told their stories. He described the conference as a "progress report." Some of the aircraft and engine builders are ahead of their schedule, he added, some are behind, but all are working with great enthusiasm and confidence in the results of their labors."

Major General Squier, chief signal officer; Colonel Deeds, his chief assistant on aeroplane production, and Chairman Coffin, of the Aircraft Production Board, participated.

No plan for expansion of the existing programme is under contemplation, Mr. Baker indicated, and he said today's meeting was not called because of any shortage of aircraft with General Pershing's forces. He added that he was still without confirmation of reports of such shortage.

Petition Against Autocracy to Be Scattered Over Germany

Petitions signed by persons of German parentage in the United States are to be dropped by aeroplanes and sent by neutral routes into Germany, calling upon the people to rid themselves of autocracy and to establish a democratic form of government as the best guarantee of world peace. These petitions are being prepared by the Friends of German Democracy, which has its headquarters in the United States.



French Official Photo

One of the flying boats of the Allies at the great aircraft base at Dunkirk.

STEELS USED IN AERO WORK

By Dr. W. H. HATFIELD, Brown-Firth Research Laboratory, Sheffield, Eng.

(Continued from page 726)

Normalizing—Normalizing means heating a steel (however previously treated) to a temperature exceeding its upper critical range and allowing it to cool freely in the air. The temperature shall be maintained for about 15 minutes, and shall not exceed the upper limit of the critical range by more than 50° Centigrade.

Annealing—Annealing means re-heating, followed by slow cooling. Its purposes may be:

(*a*) To remove internal stresses or to induce softness, in which case the maximum temperature may be arbitrarily chosen.

(*b*) To refine the crystalline structure in addition to the above (*a*), in which case the temperature used must exceed the upper critical range, as in normalizing.

Hardening and Tempering

In considering the hardening and tempering of steel parts for aero and automobile work we are only following the example of the time-worn procedure of the old cutlers and armorers. Now, be it noted that a novice would never in the old days have been permitted to harden and temper, only the highest skill and experience permitting the production of the desired results, and today the same remarks apply. There is quite enough scope in the art of hardening and tempering small parts, such as used in this and other branches of engineering, to justify the growth of a class of operators with brains to understand and skill to execute the treatments required to obtain those excellent qualities which skilful hardening and tempering will induce. Bearing on this, it not infrequently happens that small parts are required in which one portion will have to be finally tempered and tough whilst the other is quite hard, and even more difficult requirements can be met providing the development of the necessary technique in the operator is insisted upon. In the whole range of steel metallurgy there is no direction where careful study and good technique can produce more valuable results.

The operation of hardening consists of quenching after raising the steel to temperatures above the critical point, at which it will exist as solid solution. In dealing with parts made of 0.3 to 0.4 per cent and under of carbon, it is not only sufficient to raise to a temperature at which the solid solution areas are formed, but the temperature must be attained at which the ferrite has also disappeared owing to its solution in the solid solution. The desirable temperature, therefore, for hardening is that at which you quench the steel as a homogeneous solid solution. If you do not go to temperatures sufficiently high for this, you simply obtain patches of ferrite, which reduce the effectiveness of the whole operation of hardening and tempering. Generally, temperatures from 800-850° C. are quite sufficient for this operation, but the actual temperature depends upon the steel, and in this connection it is particularly important that the operator should appreciate the temperatures at which the changes take place in the given steel. It might be well to here caution against the use of too high quenching temperatures.

(1) If the temperature is taken too high, an undue brittleness is introduced into the steel.

(2) Quenching from higher temperatures naturally means greater internal stresses.

(3) If too high temperatures are employed, the quenching medium, if of limited volume, becomes heated to a greater temperature during the quenching operation, and is, therefore, less effective in quenching the material, the speed at which the article passes through the critical zone being most important.

Whilst discussing hardening, it might be well to point out that rapid heating should, for obvious reasons, be avoided. It will be remembered that in speaking of "factors of safety" the question of hardness cracks was brought in, and it might here once more be emphasized that carelessness in hardening and tempering may vitiate the results of most excellent insight and care in design. It will also be fully appreciated that in the hardening operation sharp corners, angles, etc., are a disadvantage, just as in other items of process to which reference has been or will be made.

With regard to the medium employed for hardening, that is determined by the character of the steel, and may either be water, oil, or air. The tempering operation, resulting in the degree of softening required, depends upon the particular temperatures to which the hardened part is submitted, the reheating causing the breaking down of the hardened state of the steel.

It is proposed to take as examples a carbon steel, a nickel-chrome steel, and a high-chrome steel. Particulars of series of such heat treatments are given in the adjoining tables, which have been prepared from work done in the Brown-Firth Research Laboratory:

CARBON STEEL

Size of test-piece, 2 ins. × 0.564 in.
Size of piece treated, 1 in. round × 8½ ins. long.

Treatment		Y.P.	M.S.	E%	R/A%	Izod Impacts
As annealed		16.93	30.95	31.0	49.7	26, 21, 25
½ hr. 80° C. and cooled in air						
W.H. 850° C. Temp.	Nil	.....	50.47	15.0	33.47	19, 23, 16
" "	1 hr. 100° C.	.....	49.59	15.0	40.51	23, 19, 22
" "	1 hr. 200° C.	.....	49.44	14.0	34.91	16, 18, 25
" "	1 hr. 300° C.	.....	46.55	17.5	39.13	21, 17, 28
" "	1 hr. 400° C.	.....	51.26	16.75	39.13	21, 27, 33
" "	1 hr. 500° C.	31.51	47.21	20.0	49.7	34, 35, 31
" "	1 hr. 600° C.	30.12	42.3	25.5	61.48	56, 68, 53
" "	1 hr. 700° C.	24.41	36.27	33.0	69.77	84:86×28:82

HIGH-TENSION STEEL, NI-CR.

Size of test-piece, 2 ins. × 0.564 in.
Size of piece treated, 1 in. round + 6½ ins. long.

Treatment		Y.P.	M.S.	E%	R/A%	Brinell	Izod Impacts
A.H. 800° C. Temp.	Nil	41.37	56.46	19.0	49.70	3.9	18, 22
" "	1 hr. 600° C.	37.02	46.49	24.0	63.65	4.3	85, 85
" "	1 hr. 650° C.	33.08	43.73	26.75	65.76	4.4	86 10:86 11
O.H. 800° C. Temp.	1 hr. 300° C.	82.73	89.61	13.0	54.60	3.2	4, 4
" "	1 hr. 400° C.	72.09	78.98	15.5	58.11	3.4	14, 13
" "	1 hr. 500° C.	59.88	64.83	19.5	62.58	3.6	54, 55
" "	1 hr. 600° C.	49.32	55.15	23.0	63.65	3.9	71, 75, 74
" "	1 hr. 625° C.	46.28	52.89	24.0	65.76	4.0	78, 77, 78
" "	1 hr. 650° C.	39.79	50.54	25.5	65.76	4.05	81, 79, 79
" "	1 hr. 675° C.	35.45	51.71	23.0	58.11	4.0	59, 63, 65
" "	1 hr. 700° C.	34.66	53.54	23.0	47.15	4.0	56, 55, 53
" "	1 hr. 725° C.	40.18	58.69	19.0	36.34	3.9	43, 40, 48
" "	1 hr. 750° C.	40.18	59.33	17.0	33.47	3.9	23, 20, 2?
W.H. 800° C. Temp.	1 hr. 600° C.	51.33	56.64	24.0	64.71	3.9	73, 76
" "	1 hr. 625° C.	47.59	53.06	24.0	65.76	4.0	86, 85
" "	1 hr. 650° C.	44.12	51.80	26.0	67.80	4.2	85, 86

STAINLESS STEEL

Size of material, 1⅛ in. round × 7½ ins. long.

Treatment		Y.P.	M.S.	E%	R/A%	Brinell	Izod Impacts
A.H. 875° C. Temp.	1 hr. 500° C.	70.9	85.9	13.0	40.5	3.12	
" "	1 hr. 600° C.	44.5	53.6	21.0	59.2	3.9	69, 73, 69 & 59
" "	1 hr. 700° C.	31.6	45.2	26.0	64.6	4.25	86+3, 86+13 & 86+17
" "	1 hr. 750° C.	29.5	43.9	28.0	63.6	4.25	86+16, 86+26 & 86+25
" "	1 hr. 800° C.	31.6	43.3	27.0	64.7	3.7	33, 33, 43
O.H. 875° C. Temp.	1 hr. 500° C.	72.6	90.5	8.0	18.23	3.1	
" "	1 hr. 600° C.	39.4	52.0	20.0	56.9	5.9	72, 67, 76
" "	1 hr. 700° C.	34.8?	47.1	25.5	63.8	4.07	84, 86, 86
" "	1 hr. 750° C.	39.4	44.1	27.0	66.3	4.2	86+33, 86+29 & 86+42
" "	1 hr. 800° C.	59.1	71.6	4.0	11.7	3.67	24, 24, 18
W.H. 875° C. Temp.	1 hr. 500° C.	70.9	90.2	12.0	34.2	3.1	
" "	1 hr. 600° C.	40.3	53.9	22.0	59.8	3.87	83, 80, 80
" "	1 hr. 700° C.	29.5	45.8	25.8	64.7	4.1	86+35, 86+34 & 86+24
" "	1 hr. 750° C.	30.0	43.7	27.0	65.2	4.22	86+12, 86+15 & 86+19
" "	1 hr. 800° C.	30.6?	48.0	18.0	59.2	4.3	86+39, 86+34

These figures will illustrate the different responses which these types of material make to similar heat treatments.

Owing to the composition of such material, the critical changes become so sluggish that merely heating up to a certain temperature and cooling in air is sufficient to effectively produce the hardened condition. This property also allows of larger objects being hardened throughout and, incidentally, owing to the less drastic effect, does not so easily result in cracking. Air-hardened steel after forging and rolling is already in such a hardened state that tempering alone will put it into fairly good condition. It might also be pointed out that since billets and forgings, after working, are hard, they should only be heated slowly and with the utmost care; rapid heating causes a good deal of trouble.

Machining Properties

There are a few difficulties which arise in connection with machining. For instance, if the tensile of the material exceeds 60 tons per sq. in., machining becomes very difficult, and if much higher tensiles are required it is necessary to heat treat the material afterwards. (For parts which have to be hardened after machining the material can be worked in a soft condition with accuracy and speed.) For complicated parts this introduces difficulty owing to the distortion, etc., produced in final heat treatments, but these troubles are now being largely diminished, and, after all, much depends upon the steel chosen, and methods of working. One interesting point which I think is fully deserving of discussion is the apparent fact that the Brinell figure does not necessarily indicate the ease with which the material will machine. When one considers actually what takes place during machining, *i. e.*, the manner in which local stresses and deformation, ending in the complete separation and rupture of the turnings, take place, it certainly would appear that there are steels and conditions of steels with which it could not be expected to have a definite indication of the machining properties from the Brinell hardness numbers (manganese steel, in the toughened condition, being one abnormal case in point). Sometimes trouble is encountered owing to the material being too soft; for instance, in the machining of aero cylinders the material will drag if the Brinell hardness number be below a certain figure, but I think a good deal of this difficulty can be got over by modifying the angles to which the cutting tools are ground. The speed, too, at which the work is done in such a case is a factor. If, however, in the case of carbon steel, the Brinell is studied, it will not be proved unreliable, as experience shows that with such steels a careful check of the hardness by this method will result in solving the trouble. It is interesting to record that with the mildest steels the actual size of crystal and amount of inclusion influence the machining properties of the material.

Case-Hardening

The process of case-hardening is employed when it is desired to obtain a hard shell supported on a tough interior. There are several parts in which you are interested in your particular work for which this process is used, and I therefore propose to briefly discuss the principles involved. The properties ultimately required in the core largely determine the type of steel which you may select, although the quality of the hardened case also determines the material available. For instance, if the hardest of cases is required, it would not be desirable

to use a case-hardening steel high in nickel, since experience indicates that the presence of nickel measurably reduces the maximum hardening effect which can be obtained in the case. It will, therefore, be necessary to carefully study the general properties required in the final article before a decision is made with regard to the steel to be employed. When the objects are ready for case-hardening they are packed in a suitable carburising medium and raised to temperatures of 900-950° C, at which they are maintained for the time necessary to give the required depth of case. This period may be anything from 2-12 hours.

To discuss the case-hardening of a carbon case-hardening steel. From remarks made earlier in this paper it will be apparent that when a temperature of 900 is obtained, the steel of which the article consists will structurally have become a homogeneous dilute solid solution of carbide in iron, the iron then being in the condition in which it will dissolve very much more carbon than that originally contained in it. The result is that on being placed in such a condition in contact with the carburising medium, solid or gaseous, carbide of iron is synthetically produced where the article and the medium are in contact, and then this carbide is systematically dissolved and diffused into the steel. Since, if equilibrium were allowed to be attained, *i.e.*, if the steel were allowed to dissolve as much carbon as its condition at such temperatures would permit, it would become to all intents and purposes a steel of high carbon content throughout its thickness, it is necessary to determine by experience with the particular materials employed how long exposure is required just to produce the requisite thickness of case. After the required time at the carburising temperature the steel obviously consists of a shell of solid solution high in carbon, with a core of solid solution low in carbon, and so on cooling down we have different changes in structure in the two materials, pure iron (ferrite) crystals making their appearance in the core, whilst the case persists as a homogeneous solid solution (apart from the separate excess carbide existing in it) right down to the carbon change-point. When cold, as time has not permitted the carbide to diffuse into the core of the mass, we have in the central portion approximately the original structure. Experience teaches us that the carburising operation leaves the core in a coarse condition, and it is, therefore, desirable to re-heat the articles to a temperature of 850-900° C., followed by cooling in air or by quenching as a refining operation.

Having carburised the articles, they now require hardening, and I do not hesitate to say that this hardening operation requires all the possible skill available in the operator. It will be clear from previous discussion that when the carburised articles attain a temperature of 730-740° C. the whole of the case, but only the pearlite areas of the core, become solid solution, *i.e.*, capable of producing the hardened condition of steel. It will thus appear that there is a theoretical temperature which, if attained throughout the article, would give a hardened case with a minimum section of area of hardened material in the core; if this temperature is exceeded, the solid solution areas in the core grow progressively in size owing to the gradual solution of the ferrite into the already existing solid solution areas, and at a temperature of a little over 800° C. the whole of the core will have again become a homogeneous solid solution capable of being hardened. I think it will be obvious from this that the core may be trapped by quenching in very different conditions; it may consist either, with lower quenching temperatures, of a matrix of soft ferrite with hardened steel "inclusions" embedded in it, or of a matrix of hardened steel with soft iron "inclusions." The fracture and, incidentally, the mechanical properties of the core will vary widely with the quenching temperature, and once you have decided the kind of core you want, only the most careful workmanship, coupled with an appreciation of the underlying principles, can systematically produce the required result.

Before leaving this part of the subject it would be well to emphasize that there is a danger in too low quecning temperatures. One of the great troubles of people who practice the case-hardening process is the appearance of "soft spots." One of the most definite and obvious explanations of "soft spots" is that the material has been quenched at so low a temperature that at certain centres during the quenching operation the breaking down of the solid solution is permitted to occur. When this happens, if the case-hardened article is etched, you will have the "soft spots" definitely shown up as dark etching areas.

Case-Hardened Gears, Etc.—Whilst dealing with case-hardening it would perhaps be well to make a few comments on gear wheels, etc.; the stresses in such parts are of interest. The teeth are submitted to (*a*) a bending action, producing direct tension and compression; (*b*) local surface pressure and abrasion. The body is submitted essentially to torsion, which produces shear. The loads to which the gear is submitted are all fluctuating and frequently applied with shock. The respective merits of soft and tough core as against uniform hardness throughout seem to form a perennial subject for discussion, but it would appear to me that the comparative merits depend essentially on the amount of shock which has to be withstood. If the parts were not submitted to shock and everything ran perfectly smoothly, then it would be clear that the properties required in the material are surface hardness (resistance to wear) and resistance to fluctuating stresses. Such conditions are best fulfilled by uniform hardness. If gears could be perfectly designed and machined, and if they retained their shape absolutely during hardening, and there were no change of gear or other sudden applications of load, then shocks would not require to be dealt with. Unfortunately, it is impossible to attain these ideal conditions in practice. The slight distortion in the shape of the teeth is sufficient to change smooth running into a series of shocks, particularly whilst the wheels are new. Now to consider the question as to whether a soft core does help to withstand shocks, it has been suggested that the capacity of the interior for deformation in such a case is not brought into play until the skin has been deformed beyond its elastic limit, *i.e.*, until the part has been ruptured. In my opinion this is not a correct view of the case. The core, having a lower elastic limit, reaches that value before the skin becomes permanently deformed. After this point the deformation produced is greater than would be produced in a wheel of uniform hardness, the stresses in the skin still being within the elastic limit. It should also be remembered that the stresses produced in a thin hollow case for a given deformation are less than would be produced by the same amount of deformation in a solid body of the same material and external shape. With a very thin casing the soft interior takes up the bulk of the energy of the shock and the hard outside takes up the deformation without becoming very severely stressed. This deformation may, however, be of a permanent nature, involving residual stresses within the elastic limit in the casing. I think it will be clear that this argument points to a soft core as being the best for gears which have to withstand shocks, and I shall be interested to hear the result of your experience in this matter.

When we come to discuss a case-hardened ball race we find that we have to consider not so much the question of shock, but the resistance to fluctuating stresses. For this purpose a too soft core would be a disadvantage and the maintenance of a higher standard of strength should be taken into consideration during manufacture. It might be claimed for a soft core in this case that a slight yielding in the ball would tend to increase the area of contact between the ball and race and so decrease pressure per unit area. I would, however, suggest that slight modification in the design of the ball and race, with a view to modifying the relative curvature of the surfaces would give the same results without stressing the material beyond the elastic limit at any point.

Classifications

The war has emphasized the necessity for standardization of materials and parts generally, and particularly does this apply to automobile and aero engineering. Before the war the steels employed were legion, but as the consumer was actually only getting one quality for each purpose, little trouble was experienced. The war, however, necessitated such large supplies that he had to obtain his supplies from several sources, and, consequently, got very different steels for the same purpose, with disadvantages far too apparent to require discussion. I have already insisted upon the necessity of the engineer understanding the characteristics and possibilities of the steels with which he has to deal, and it will obviously be an advantage to him if the types of steels are limited to a selected number of the most suitable, so that he will be enabled to focus his attention and have a much greater chance of acquiring that necessary intimate knowledge which his work demands. The Institution of Automobile Engineers have a committee (of which I have the pleasure of being a member) which has selected and defined the compositions of a number of suitable steels, and the same committee is now at work thoroughly investigating their properties. At the same time it should be remembered that specifications cannot deal with all the useful steels, as there are many, specially made for certain purposes, which are necessarily difficult to so include; furthermore, steel-making is one of the most progressive arts, and from time to time, no doubt, new steels will come along possessing properties of sufficient merit to give them place. I would, therefore, suggest that a progressive branch of engineering like yours should not be unduly fettered by too rigid standardization, and have faith that if you will only express your needs the steel industry will take a pride in responding to them.

Bearing upon specifications, the analysis is not all sufficient, and, indeed, satisfactory mechanical proof tests are not in themselves complete, since one of the greatest troubles which you engineers have to consider consists in the occasional local unreliability. The whole process of production requires the most careful study and attention, and it is up to the steel-maker to see that all the factors entering into the complete reliability of the ultimate product receive the attention which they merit. To begin with, the actual melting and refining operations require complete understanding and control; the actual casting temperature is a vital factor in determining the relative position of unsoundness, etc., in the resulting ingot; the shape of the ingot is also very important. These three items have a great bearing upon reliability and freedom from segregation, which two items I would suggest are of extreme importance. When we come to the actual working down of the steel, here, again the technique is so important that if the steel is placed in indifferent hands the best of material may be rendered indifferent, or, indeed, may be ruined. The speed with which the ingots or blooms are reheated, together with the actual temperature at which the material is soaked before working, are important, and it is not necessary for me to point out that there are factors in the actual rolling and hammering operations which require detailed experience if those sections of process are to be satisfactorily dealt with. Incidentally, the actual temperature at which the material is finished in the mill or at the hammer has a bearing on the results.

Conclusions

It may be useful to summarize the views expressed in the foregoing paper on the manufacture and use of steel for aero work. I have endeavored to avoid being dogmatic in any sense, recognizing that any personal view can only be limited in its survey. At the same time I have not hesitated to state the impressions derived from my experience, and trust that the subsequent discussion and the views expressed will be similarly free from hesitation. It is only by a free exchange of ideas and unstinting collaboration between the different sections concerned that progress can be made. In the Introduction I emphasized the importance of using only the highest class of materials for aero work, and this, I think, will be uncontested. The necessity for scientific methods in works practice needs, I am sure, no further argument before this Society. As regards design and factors of safety, I have expressed the views occurring to a metallurgist in the hope that they might draw forth helpful criticism from the engineering side. And here let me once more make a plea for a still more perfect understanding between the engineering and the metallurgical branches; the work of the one is necessarily complementary to the other, and an unmistakable impetus to continuous evolution of practice will be induced in proportion to the degree of collaboration attained.

It may appear that I gave up too much space to the mechanical testing of steels, but in extenuation I would point out that it is my opinion, and I think, the opinion of many others, we have much to learn not only with regard to the various methods employed in testing steels and material generally, but also with regard to the interpretation of such results. Incidentally, the continued correlation of the behavior of different materials under the various forms of test cannot but give increasingly invaluable knowledge to the individuals who are concerned with questions of design.

Perhaps the most important point which I have endeavored to push home is the prime necessity for efficiency in manufacture; in steel making, in design, in forging, and in heat treatment, the efforts of the steel maker, the stamper, and the engineer must be unrelenting. Not only does this apply to those in charge; more important still is it that the workman who ultimately carries out the work should be taught and encouraged to make his work a labor of love. It is the excellence of to be the chief factor in making for reliability. technique in the various items which is going to be the chief factor in making for reliability.

More Aviation Field Landing Places Required

Plans for increasing the number of landing stations at the various aviation training fields, in an effort to decrease the number of accidents are being made by the War Department and the Aircraft Board. Many of the recent fatalities, it was pointed out, were due to collisions in the air. With more landing stations spread out over wide territory officials believe that the probabilities of accidents of this character will be greatly reduced.

German 'Planes Built of Inferior Material

Captured German aeroplanes brought to this country for study by aviation experts revealed that the Germans are using materials very inferior to the standards set for American 'planes and apparently are very short of spruce and linen.

The wing beams of the captured German 'planes were made of thin pieces, some of them less than an inch in thickness, put together with glue and nails. Specifications for American 'planes require a solid beam of the finest and toughest spruce. Wings of the German 'planes are covered with a fibre cloth, instead of the approved linen.

ON THE MAXIMUM FLIGHT VALUE OF AEROPLANES

By UMBERTO NOBILE, Engineer*

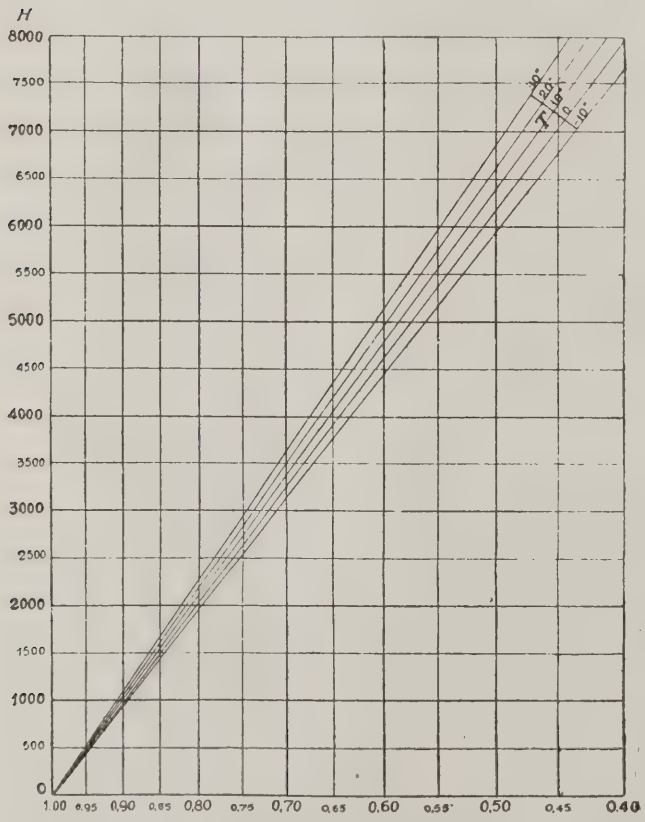
THAT there is for every aeroplane a maximum flight value that cannot be exceeded is not only well known from practical aviation, but is also self-evident when we consider that, as the density of the atmospheric air diminishes with the altitude, the motor force at disposal also decreases, while, on the other hand, the force necessary for the support of the machines increases. This limitation, further, would apply to all apparatus in which, as in the case of the aeroplane, use might be made of the reaction of the air as a sustaining and propulsive force, and where atmospheric oxygen might be employed for the development of the motor force, indeed, in the extreme case, of an air without density—that is to say, outside the atmosphere—flight would be impossible.

The maximum flight value may also be called the *value of tangentiality,* deducing this term from the very apt expression usually adopted by pilots, who, when the maximum value is attained, say that the aeroplane has become *tangent.*†

The value of tangentiality thus appears *a priori* to be essentially connected with the *excess of motor force that can be disposed of on the aeroplane.* This excess (which means the difference between the maximum force D that the motor can effectively develop, and the minimum effective force, N, which is necessary for flying) is measured in correspondence with given value, and for a given density of the air, thus for example at sea level, at a temperature of 15° C., and at an atmospheric pressure of 760 mm. But it is at once seen that, in the matter of which we are dealing, the above-mentioned difference is of much less importance than the ratio, which we shall express by ρ_o, between the two above-mentioned values:

$$(1) \qquad \rho_o = \frac{N_o}{D_o}$$

But on examining the problem more closely, we see that in order to determine the value of tangentiality, $H_{max.}$, it is not sufficient to know the value ρ_o, but it is necessary also to know the law according to which the ratio $\rho = \frac{N}{D}$ varies with



T = Temperature recorded on ground level
ϵ = Air density at top level.
Air density on ground level

the variation in the density of the air. In other words, if ϵ be the ratio between any value γ fo the density, and a fundamental value γ_o, it will also be necessary to know the function;

$$(2) \qquad \rho = \Phi\ (\epsilon)$$

If then we also know the law according to which the ratio ϵ varies with the height, H:

$$(3) \qquad \epsilon = \psi\ (H)$$

the problem may be said to be solved, since by substituting in (3) the value of ϵ defined by the equation $\Phi\ (\epsilon) = 1$ we have the required value of H max.

Is it possible to know *a priori* exactly the above-defined functions ρ and Φ? Evidently it is not; but nevertheless, as we wish to treat of the question theoretically, we must content ourselves with putting forward approximately credible hypotheses, all the more so since hitherto very few experiments have been made for the purpose of directly determining for a given type of motor and machine the function Φ while on the other hand, ψ by its very nature, since it depends upon elements that defy analysis, cannot be expressed in exact terms which will hold good for all practical cases.

However, although it can only be based on roughly approximate hypotheses, the theoretical treatment of this subject allows of our reaching in our final results a sufficient degree of approximation, while at the same time it presents the undoubted advantage of putting clearly in evidence the importance of those elements on which depends the value of tangentiality.

The Variation of the Ratio ϵ in the Vertical Direction

The variations in the density of the air in a vertical direction depend essentially on the variations of temperature and pressure.

As for the temperature, without taking into consideration the well-known *phenomenon of inversion,* which is easily verified in the strata nearest the ground up to 200 or 300 meters in altitude, and sometimes as high as three or four thousand meters, it may be admitted, as the average result of numerous observations made with sounding balloons, that from sea level to about 8,000 meters the gradient, which we will call G, referred to an inequality of level of 100 meters, increases about $\frac{1}{20}$ of a degree for every 1,000 meters. More precisely, if we express H in thousands of meters, we have:

$$(4) \qquad G = 0{,}40 + \frac{1}{20} H$$

and hence the decrease of temperature calculated from the sea level is expressed by:

$$(5) \qquad \Delta T = 4H + \frac{H^2}{4}.$$

But, as regards the calculation of the density, a relatively small mistake is made, if we take, instead of the variable gradient given by the formula (4), a constant medium value, G, assuming this to be the value 0,55 corresponding to 3,000 meters of altitude.

Keeping the gradient constant, we find by means of a very rapid simple calculation that the ratio between the pressures p and p_o of two points of the vertical is equal to the ratio of the corresponding absolute temperature raised to the power of $\frac{1}{R\ Gm}$, where R is the characteristic constant of dry air

$$(6) \qquad \frac{p}{p_o} = \left(\frac{T}{T_o}\right)^{\frac{1}{R\ Gm}} \left(\frac{T_o}{T}\right)^{6{,}2}$$

and in consequence the ratio ϵ between the corresponding densities will be expressed by:

$$(7) \qquad \epsilon = \frac{p}{p_o}\frac{T_o}{T} = \left(\frac{T}{T_o}\right)^{\frac{1-R\ Gm}{R\ Gm}} = \left(\frac{T}{T_o}\right)^{5{,}2}$$

If, then, H, is the difference in level between the two points we have:

$$T = T_o - GmH$$

and hence:

$$(8) \qquad \epsilon = \left(1 - \frac{Gm}{T_o} H\right)^{\frac{1-R\ Gm}{R\ Gm}} = \left(1 - \frac{0{,}0055}{T_o} H\right)^{5{,}2}$$

by which formula is determined the function ψ defined by (3).

* Courtesy Rivista Tecnica d'Aeronautica.

† That is, tangential to the flight-path or tail-heavy.—Ed.

For greater convenience we have represented the formula (8) graphically, by constructing an abacus with radiating lines; the simple reading of this allows us to determine the value ϵ corresponding to a given height, H, and to a given temperature at the ground. The use of the abacus is so simple that it requires no explanation.

Variation of the Ratio ρ With the Density of the Air

(*a*) Force necessary for propulsion.

Taking a *régime* of rectilinear and uniform motion along a trajectory inclined at β degrees above the horizon, the effective force necessary for the propulsion of an aeroplane of P weight, a carrying surface, S, and a retarding surface equal to σ is expressed by:

$$(9) \quad N_o = \sqrt{P^3}\left[\left(\frac{K_x}{K_y} + \frac{K_q\,\sigma}{S\,K_y}\right)\cos\beta + \operatorname{sen}\beta\right]\sqrt{\frac{\cos\beta}{S\,K_y}}$$

where x being the direction of the trajectory and y its normal direction, the total reaction, R, developed by the air on the wings, is considered as the resultant of $R_x = KS\,V^2$ and $R_y = K_y S\,V^2$ representing by V the velocity of the aeroplane. The coefficients of resistance K_x and K_y, thus defined equally with the coefficient K_q, which is the one relating to the equivalent retarding surface (the flat square surface normally orientated according to the wind) are, as is well known, proportional to the density of the air. If then these values K refer to a certain fundamental density γ_o, for any other value $\gamma = \epsilon\,\gamma_o$ of the actual density, the coefficients will become:

T = Temperature recording on ground level.

ϵ = Air density at top level. / Air density on ground level.

surface (the flat square surface normally orientated according to the wind) are, as is well known, proportional to the density of the air. If then these values K refer to a certain fundamental density γ_o, for any other value $\gamma = \epsilon\,\gamma_o$ of the actual density, the coefficients will become:

$$K'_x = \epsilon\,K_x$$
$$K'_y = \epsilon\,K_y$$
$$K'_q = \epsilon\,K_q$$

and in consequence, taking into account (9) we have:

$$(10) \quad N = N_o\sqrt{\frac{1}{\epsilon}}$$

that is to say, *the effective forces of propulsion are related to each other in the inverse ratio of the square roots of the density of the air:*

(*b*) Motive power at disposal.

In explosive motors it may be considered that the amount of benzine burnt for every revolution is approximately proportionate to the density of the surrounding air. If then with the variation in the density the velocity of the motor's rotation remains invariable, and we exclude the variations that may be undergone by total output of the motor-propulsory group, it may be concluded that the effective power at disposal is directly proportional to the density of the air. This proportion is admitted to be true only as a rough approximation, since hitherto the experimental data are wanting which would allow of our testing how far it corresponds to the reality.

We have, therefore, in the hypothesis above stated:

$$(11) \quad D = \epsilon D_o$$

The formulæ (10) and (11) now allow us to calculate the value of the ratio, ρ, in the functions of ρ_o and of ϵ:

$$(12) \quad \rho = \frac{N}{D} = \frac{N_o\sqrt{\frac{1}{\epsilon}}}{D_o\,\epsilon} = \rho_o\sqrt{\frac{1}{\epsilon^3}}$$

by which is defined function Φ, for which see formula (2).

Determination of the Value of Tangentiality

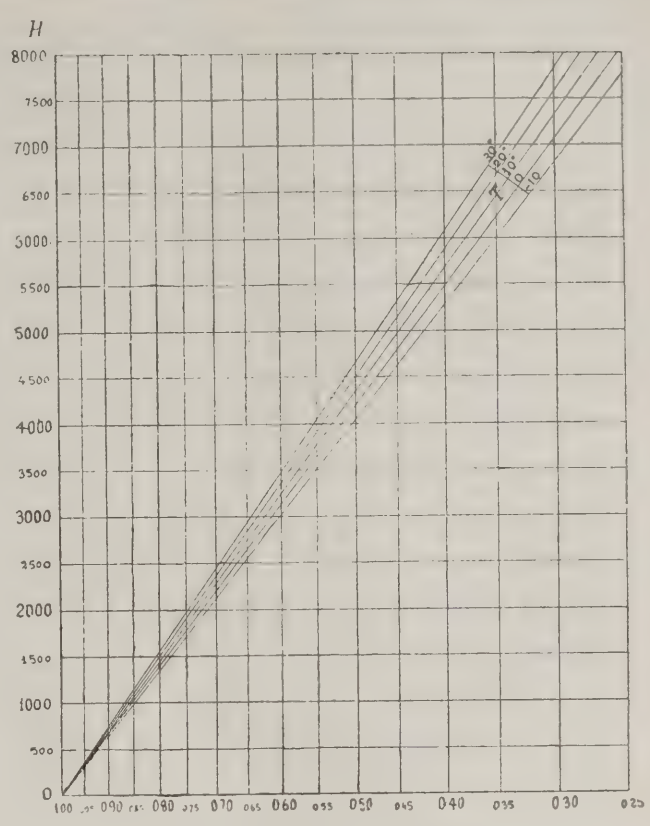
Putting in (12) $\rho = 1$, we obtained the value of ϵ in correspondence with which the motive power at disposal exactly equals the effective power:

$$(13) \quad \epsilon = \rho_o^{\frac{2}{3}}$$

Substituting the value in (8), we obtain the equation:

$$\rho_o^{\frac{2}{3}} = \left(1 - \frac{Gm}{T_o}\,H_{max}\right)^{\frac{1 - RGn}{RGm}}$$

from which is deduced the value of the value of tangentiality:



T= temperature at ground level.

$$(14) \quad H_{max} = \frac{T_o}{Gm}(1 - \rho_o\alpha)$$

in which the exponent α equals:

$$\frac{2}{3}\,\frac{R\,Gm}{1 - R\,Gm}$$

that is for $R = 29{,}27$ and $Gm = 0{,}0055$:

$$\alpha = 0{,}128.$$

The formula (14) shows that for a given value of ρ_o *the maximum altitude attainable by an aeroplane is approximately proportional to the absolute temperature at ground level.*

In order to facilitate the calculation of the value of tangentiality, we give the values of

$$\frac{1 - \rho_o^{\alpha}}{Gm}$$

for a series of values ρ_o which can be practically realized. If we multiply the value

$$\frac{1 - \rho_o^{\alpha}}{Gm}$$

by the absolute temperature T_o at the level of the ground, we shall at once obtain the maximum altitude above the ground which can be attained by the machine.

$\rho = 0{,}25$	$\frac{1 - \rho_o^{\alpha}}{Gm} = 29{,}56$			$\rho = 0.65$	$\frac{1 - \rho_o^{\alpha}}{Gm} = 9{,}74$		
" 0,30	" 25,96			" 0,70	" 8,11		
" 0,35	" 22,85			" 0,75	" 6,53		
" 0,40	" 20,13			" 0,80	" 5,13		
" 0,45	" 17,65			" 0,85	" 3,74		
" 0,50	" 15,44			" 0,90	" 2,43		
" 0,55	" 13,40			" 0,95	" 1,18		
" 0,60	" 11,49			" 1,00	" 0		

It would be still easier to use the abacus with radiating lines which is made on the base of formula (14), since by merely reading it, it is possible to estimate the maximum altitude for any value of ρ_o, and for ground temperatures varying from $-10°$ C. to $+30°$ C.

Examples:

For roughly approximate calculations it may be considered that in horizontal flight at sea level, under average conditions

(*Continued on page* 1167)

FOREIGN NEWS

AUSTRIA

The Austrian official announcement of February 28th reports Italian bombing raids as follows:

"Italian aviators bombarded Cies, Messelombardo and Bozen, all unfortified towns, far behind our front."

BELGIUM

Lieutenant Thierry, who holds the best fighting record in the Belgian aviation squadron, was brought down on Saturday in a fight with four adversaries and fell inside the enemy's lines behind Woumen. Thierry had the destruction of ten enemy aeroplanes to his credit."

On February 24th it was announced that:

"Our aviators have carried out a number of flights and engaged in several aerial combats."

FRANCE

The French communication of February 23rd summarized nine days' aerial activity as follows:

"From February 11th to February 20th sixteen German aeroplanes and two captive balloons were destroyed by our chase aeroplanes, and four others were brought down by the fire of our special guns. In the same period, in addition, twenty-one enemy machines, seriously damaged in aerial fighting, fell inside their own lines."

Bombing activity is described in the communication of February 27th as follows:

"German aviators bombarded Nancy last night. Two persons were reported killed and eleven wounded.

"On February 26th three German aeroplanes were brought down by our pilots. Our bombing escadrilles dropped 4,500 kilos of explosives, notably on the railway stations at Metz-Sablons and Warmerville."

Ambitious reconnaissance flights are reported in the announcement of March 1st:

"On Tuesday a French aerial squadron carried out a photographic reconnaissance as far as Marienbourg, more than eighty kilometres (fifty miles) behind the German lines."

Reporting operations on the Balkan front, the French communication of February 26th says:

"On the right bank of the Cerna our aviators bombed the Cestova station."

GERMANY

The German communication of February 22nd reports successful combats as follows:

"During the last three days twenty-four enemy aeroplanes and two captive balloons have been brought down in aerial fighting or by gunfire."

Press despetches dated February 24th report Allied bombing raids as follows:

"German papers announce several Allied air raids on German towns last week. Bombs were dropped at Wehlan Monday, there being three victims of the explosion. There was slight damage done. The town of Pirmasens, Bavaria, was bombed February 24th. Several persons were wounded and some damage was done to houses.

"Raiders visited Mannheim on the night of February 24th and a child was killed and a woman and a child were injured there, the newspapers say."

Numerous combats are reported on February 27th, as follows:

"There were a great many violent duels in the air, an attack by the English aviators against our balloons on the Oise and Aisne sectors breaking down. Yesterday we brought down fifteen enemy aeroplanes and three captive balloons. Captain Ritter von Tutschek won his twenty-fourth victory in the air. Flight Private Kaffher brought down two captive balloons."

On March 1st the Germans announced that:

"An enemy air raid on Kortrijk (Courtrai, twenty-six miles northwest of Ghent) caused considerable losses among Belgians."

GREAT BRITAIN

The extended bombing operations described in the announcement of February 23rd indicate that the Air Ministry is carrying out its policy of increased activity against German centers. The announcement is quoted in full:

"The weather improved Thursday and more than three hundred bombs were dropped on the enemy's billets and railway sidings at Courtrai and Ledeghem and southeast of Douai. In air fighting seven hostile machines were brought down and two others were driven down out of control. Three of our machines are missing.

"During the night our aeroplanes dropped 678 bombs, of which 300 were on the aerodrome southest of La Cateau, used by the enemy's night bombing squadron. The other bombs were dropped on aerodromes in the neighborhood of Ghent and Tournai and on billets. One of our machines did not return."

Three weeks' activity in the air is summarized in an Associated Press despatch dated February 26th, as follows:

"Seventy-five enemy aircraft were brought down by the Royal Flying Corps on the western front from February 1st to 22nd, inclusive, according to an announcement made to-day by the British Air Ministry. During the same period 39 enemy aircraft were driven down out of control and six were brought down by anti-aircraft defences and infantry.

"Against these 120 machines of the enemy, says the statement, 28 of the Allies are missing. The weight of bombs dropped during the month to February 22nd was 65 tons.

"On the Italian front, since the arrival of the British airmen to the present time, 58 enemy machines, principally German, have been destroyed. The British losses for the same period were eight. Many hostile machines, the statement adds, have been driven down out of control.

On February 27th the British official announcement reported great bombing activity as follows:

"The weather was fine on Tuesday, but a strong west wind greatly favored the enemy in the air fighting. Four tons of bombs were dropped on large railway sidings at Courtrai, a railway junction midway between Douai and Valenciennes, two airdromes north of Douai and billets.

"The fighting in the air was severe, and there were many combats between the enemy's scouts and our reconnaissance, bombing and fighting machines. One enemy machine was brought down by gunfire, another was forced to land inside the British lines, and twelve others were brought down. Eight of our machines are missing.

"During the night more than half a ton of bombs were dropped on the barracks and railway stations at Treves. The same night nearly one and one-half tons of bombs were dropped on an aerodrome near Metz. One hostile machine was brought down. All of ours returned safely."

The British official communication dealing with the operations of the British forces in Italy, issued on February 22nd, says:

"Our aeroplanes have made several successful bombing raids and destroyed an enemy dirigible shed. The enemy continues to bomb back areas and towns when the weather at night permits. Two of his machines were destroyed recently in returning."

According to a news dispatch:

"In one day Captain I. Reilly got five enemy machines, three of them out of one patrol he met. The next day he met a single enemy machine and from 13,000 feet chased it down to 1,000 feet, when it turned over and crashed. One enemy plane fell victim to his unerring shooting the following day."

ITALY

A news despatch says that:

"Five Entente airmen flying over the Julian Alps on February 20th found that the City of Innsbruck, Austrian Tyrol, was not protected by anti-aircraft guns.

"The airmen thereupon swooped down to within three hundred yards of the ground, picked out targets and copiously bombed them, including the railway station, barracks and two new munitions factories.

"Many soldiers and civilians were killed. The German Consulate was hit, and trains loaded with soldiers on their way to the Trentino front were attacked by machine guns from a low altitude."

The official statement issued by the War office on February 22nd says of aerial activities:

"During the morning English aerial squadrons bombarded enemy aviation grounds north and south of the Oderzo-Portogruaro Railway line.

"During the day three enemy aeroplanes were brought down in the course of aerial engagements, including one by British airmen."

The official announcement of February 22nd states that:

"Our aeroplanes have made several successful bombing raids and destroyed an enemy dirigible shed. The enemy continues to bomb back areas and towns when the weather at night permits. Two of his machines were destroyed recently in returning.

"Since the British arrived here our flying corps have destroyed fifty-eight hostile machines, principally German, while we have lost eight. Many other hostile machines have been downed out of control."

On February 23rd the Italian communications reported:

"An enemy aeroplane was brought down by one of our airmen and two others by British aviators."

Extensive bombing operations are reported in the announcement of February 25th, both by Italian and enemy aviators:

"There was intense aerial activity during the day over the first lines. Four enemy machines were brought down, two by the French and two by us. They fell in the region of Monte Grappa. A fifth, hit by our anti-aircraft batteries, came down in flames near Borso. At night our aeroplanes bombed railway stations at Mattarello, south of Trent, and Primolano, where there was an intense traffic, and also bombed enemy aviation camps near La Comina and Saint Fior di Sopra.

"Again hostile machines have dropped bombs on inhabited places at Castelfranco, Mestre and Venice."

Successful bombing raids occurred on the night of February 26th, as described in the announcement issued the following day:

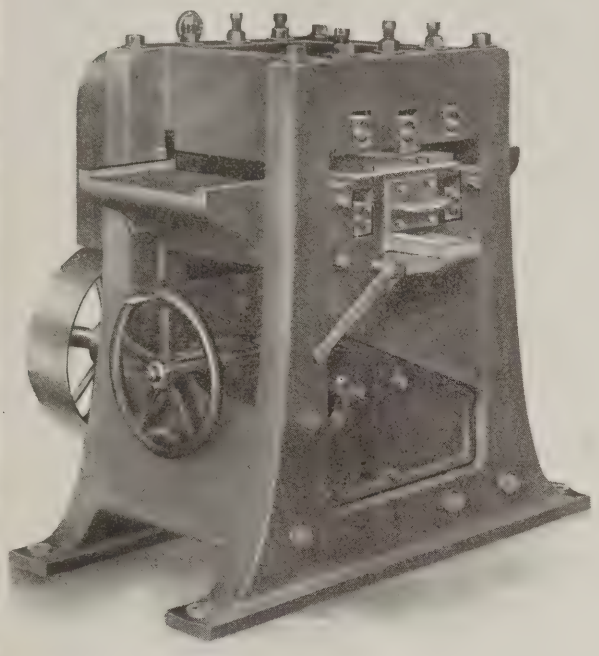
"In the neighborhood of Cismon an enemy ammunition store was hit successfully by our aviators. Tuesday night our flying squadrons bombarded efficaciously railroad structures at Bulzano and Pergine. Numerous hostile machines made incursions over the plans. They dropped bombs on inhabited localities between Treviso and Venice, and with particular fury over Venice."

Six tons of bombs were sent to the enemy on February 28th, causing great damage.

"Day and night there is great aerial activity along the front. Our aviators successfully dropped six tons of bombs on several military places. British airmen brought down two enemy machines. Near Pieve di Soligo a captive balloon was hit by our artillery fire. During the enemy raid on Wednesday night two of their machines were brought down."

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It will pay you to investigate.

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(*Continued from page* 1163)

of temperature and of pressure, the present aeroplanes absorb a motive power of about 75 h.p. for every 1,000 kg. of weight

T = temperature at ground level.

(1). If, then, II is the maximum motive power installed in the apparatus, the ratio ρ_o can be approximately calculated.

$$(15) \qquad \rho_o = \frac{75}{\text{II}} \times \frac{P}{1000} = 0{,}075\,\frac{P}{\text{II}}.$$

(1) *I.e.,* an effective power N_o of about 52 h.p. for an average output of the screw of 0,70.

The value of ρ_o being known, it is possible to read on the abacus the value of tangentiality. *Vice versa,* if the value of the latter is determined, we can calculate the motor power II which it is necessary to install in the aeroplane in order to obtain that given value.

Thus, for example, supposing an aeroplane weighing 400 kg., provided with a 50 h.p. motor, we have:

$$\rho_o = 0{,}075 \times \frac{400}{50} = 0{,}60$$

and hence: H_{max} = 3,300 meters (about).

Let us now inquire what motive power is necessary to propel an aeroplane of the weight of 600 kg. in order that it may obtain the value of 7,000 meters.

We deduce from the abacus for a temperature at the ground of 15° C. $\rho^0 = 0{,}325$, and thus:

$$\text{II} = 0{,}075\,\frac{P}{\rho_o} = 0{,}075 \times \frac{600}{0{,}325} = 138 \text{ h.p.}$$

For more approximate calculations it will be necessary to determine the motive power absorbed in horizontal flight at sea level using the formula (9).

The Influence of the Weight Variations of the Aeroplane Upon the Value of Tangentiality

In the preceding treatment of the subject it is implicitly supposed that the weight, *P*, of the aeroplane remains unchanged during the flight, which, of course, is not correct since it becomes continually lighter owing to the consumption of petrol and oil.

Let μP denote the diminution in the weight of the machine; the formula (9) shows that the effective propulsive power is reduced in the ratio of from $\sqrt{(1-\mu)^3 P^3}$ to $\sqrt{P^3}$ and therefore the ratio ρ_o is reduced in the same proportion; therefore, in calculating H_{max} we must take into account a ρ'_o given by:

$$(16) \qquad \rho'_o = \rho_o \sqrt{(1-\mu)^3}$$

The increase in the resulting value is by no means negligible. Thus, for example, while for $\rho_o = 0{,}50$ and to = 15° C. we have H_{max} = 4,450 m., it only requires a diminution of 10 per cent. of the weight (that is, $\mu = 0{,}10$) for the value to rise to the value of about 5,300 m. In fact, we have: $\rho_o' = 0{,}50\ \sqrt{0{,}9^{-3}} = 0{,}427$. With a decrease in weight of 25 per cent. we should then have $\rho'_o = 0{,}50\ \sqrt{0{,}75^{-3}} = 0{,}325$, and, therefore, as we find from the abacus, the value of tangentiality would be about 6,900 m., instead of 4,450 m.

Taking into account the variations in weight, the formula (14) might be completed as follows:

$$(17) \qquad H_{max} = \frac{T_o}{Gm}\left[1 - \rho_o^{\alpha}\,(1-\mu)^{\frac{3}{2}\alpha}\right]$$

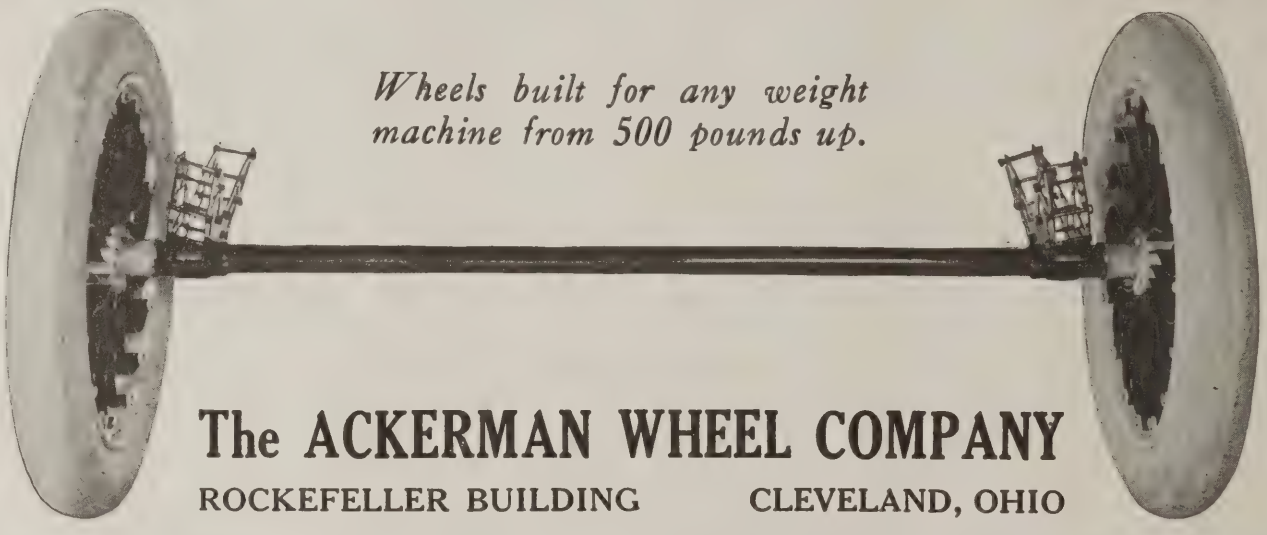
Average Values of the Value of Tangentiality for Existing Aeroplanes

In existing aeroplanes the load per h.p. $\left(\frac{P}{\text{II}}\right)$ can be taken as varying from 4,5 kg. to 9 kg., while lower values are realized by aeroplanes used for pursuit and higher values by those for bombarding. In correspondence with these limits, the ratio ρ^0, calculated on the base of the formula (15) lies between a minimum value of 0,337 and a maximum of 0,675.

These values, however, taking into account the average 10 per cent. decrease in weight owing to the consumption of petrol and oil, are reduced respectively to about 0,29 and 0,57. In consequence the value of tangentiality remains variable between a maximum of 7,700 meters and a minimum of 3,700 meters.

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(*Continued from page* 1155)

Lieut. Farré and His Unique Paintings

The canvasses which form the collection to be shown at the Anderson Galleries have been sent to this country by the French Government. The exhibition is being held under the supervision of the French Military Mission to the United States. The paintings are to be shown in all the large cities of the country, but New York is to see them first. They are the only paintings that have ever been made on the fighting front, by a fighter—at the same time an artist—of battles in the air witnessed by himself or in which he actually took part.

Lieut. Farré is not a stripling. He is a bearded veteran. He is forty-seven years of age. He is a graduate of the Ecole des Beaux Arts, and a pupil of Gustave Moreau. When the war came, he was painting portraits in Buenos Aires, but he returned at once to his native land and, although beyond the age, offered his services to France. He was assigned to the artillery, and made an observer. When Gen. Niox, Governor of the Invalides and Director of the French Army Museum, heard that Farré had become an air fighter, he named him a Delegate from the Army Museum, which gave him the privilege of practising his art at the front.

It was not long before Lieut. Farré was promoted to the rank of Observer-Bombardier, and assigned to the Ir Groupe d'Escadrille de Bombardment. This group, unlike most of the aviation units of the French army, is not attached to any Division or Corps, but is under the direct orders of the General Staff, and is sent to whatever part of the front it may be needed. Thus Lieut. Farré has flown over all parts of the line, and has taken part in practically all the great raids over German cities and munition centres, such as Karlsruhe, Dieuze and Metz.

Farré's paintings have been made at such times as he could snatch a brush, instead of dropping a bomb. That they are absolutely accurate, even to the smallest detail, goes almost without saying, for they were done under the very eyes of the heroes whose exploits they depict, and they were criticized by what might, without exaggeration, be called a committee of experts.

As historical documents these paintings are unique. As pictures they are thrilling. As works of art they are pioneers in a new field. Light effects are not the same a mile above ground as they are on the surface. Distance and perspective are distorted. Action and brilliant color are the prime characteristics of this new aerial art.

It is impossible, of course, for any artist to make sketches while flying at the rate of 100 miles an hour, with anti-aircraft shells bursting about him, and a dozen death-dealing bombs resting at his feet. But Lieut. Farré devised a sort of short hand method of noting color values and combinations. He made notes as he flew, and put his pictures on canvas before his memories faded. Thus this exhibition offers us something which we might never have had if an artist had not made an aviator, and if the aviator had not been blessed with a good luck which most of us do not associate with his calling.

Lieut. Farré has been decorated with the Croix de Guerre, and also wears the "Fouragére," which all members of his unit are entitled to wear, the entire Escadrille having been mentioned in orders.

The Reception Committee

For the Official Reception and Private View on Saturday March 9, from 3:30 to 6, at the Anderson Galleries. Mrs. Charles B. Alexander, Mrs. Edmund L. Baylies, Mrs. Nicholas Murray Butler, Miss Mary Cass Canfield, Mrs. William Astor Chanler, Mrs. W. H. Crocker, Mrs. Howard Cushing, Mrs. H. P. Davison, Mrs. Newbold Le Roy Edgar, Mrs. John Magee, Mrs. Walter E. Maynard, Mrs. E. H. Harriman, Marquise de Polignac, Mrs. W. D. Sloane and Mrs. Whitney Warren.

Help the French Children

The Sky-Fighters of France is an exhibition, organized by the French Government and aided and abetted, in the United States, by patriotic Americans of all kinds (1) To increase and foster an interest in aviation and aircraft production, (2) To support and educate the children of French aviators killed in action.

Any person interested in either of these worthy aims may send a contribution for any sum, however small, to Mr. Walter E. Maynard, Treasurer, Sky Fighters of France, 200 Fifth Avenue, New York City.



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Williams, Roy Frederick.....SLR; EHT
Womble, Claudius W.....FRF

Y

Youmans, Charles Cleveland.....SLR; VBW

X

Yarrell, Andrew J.....FLR
Yates, Francis V.....SLR

Z

Zawadski, Olaf B.....SLR

Lieut. Flachaire Flies Spad Over Central Park

Lieut. George Flachaire, French aviator, who wears several decoration and has downed seven German airmen, flew over New York City in a new Spad machine, at a speed of 135 miles an hour. After several acrobatic manoeuvres over Central Park, he returned to Mineola Aviation Field, where he is instructing cadets for the American Air Service.

Brooks Field Accepted by War Dept.

Brooks Field, San Antonio, Texas, has been accepted by the Signal Corps, and Major Henry Conger Pratt has been placed in command. The work on hangars, barracks and officers' quarters will be finished in about three weeks. Brooks Field has an area of approximately 1,000 acres and will accommodate about 5,000 men.

Records Broken at Kelly Field

All previous records of total number of flying hours were broken at Kelly Field when a total of 882 flying hours was attained Friday. This was secured with 135 machines, this being an average of eight hours of flying per machine. This is the highest record made by any school in the country.

Altitude records were broken during the week at Kelly Field, when Major H. B. S. Burwell, officer in charge of flying, went up 18,000 feet.

Daily Air Mail Service Announced by Post Office Department

The Post Office Department announced that daily aeroplane mail service between New York and Washington will begin on April 15th. Eight machines will be furnished by the War Department, and the service will be conducted for one year as part of the aviation training system of the army. One trip will be made daily each way, except Sunday, with a load of three hundred pounds of first-class mail, and a stop-over will be made at Philadelphia.

G. V. Interests Form New Aeronautical Corporation

Interests allied with those of the General Vehicle Co., Long Island City, whose plant was taken over by the government for the production of aeroplane engines, have formed the Aeronautical Engine Co. This company will take over the aircraft work of the General Vehicle Co.

H. H. Franklin Co. and Taft Pierce Making Rolls-Royce Engine Parts

Contracts for the parts of Rolls-Royce aeroplane motors have been let to the H. H. Franklin Mfg. Co. of Syracuse, which are to make 1,500 crankshafts, and the Taft-Pierce Mfg. Co. of Woonsocket, R. I. The F. B. Stears was allowed a contract a few weeks ago.

Aviation Schools in France Filled to Capacity

The demands of France for American soldiers to be given advance training in the French aviation schools have been met and all advance training in France is now filled up. Hence, all of the American soldiers enlisted in the flying service are being given their advance training in this country.

It is considered likely, however, that France will ask for more men to train as soon as the several thousand now undergoing flying instruction in France have completed their courses. At this time we will again send aspirants for aviation service abroad for their advance training.

Summary of Raids on London to 1918

"Aircraft" of London has summarized the German air raids on London, and the damage caused by the invaders. There have been 84 raids officially recorded: 1 in 1914, 23 in 1915, 33 in 1916, and 27 in 1917. As a result of these raids 1,059 people were killed outright and 2,586 injured, some of whom died as a result of their injuries later. The yearly record of deaths and injured is: 1915, 181 and 455; 1916, 274 and 581; 1917, 604 and 1,550, respectively. The raid causing most deaths occured on June 13th, 1916, when 153 people were killed and 432 injured.

Coast Guard Training Aviators for Life Saving

The annual report of the U. S. Coast Guard details progress made by the Guard, which is commanded by Capt. E. P. Bertholf, in the development of a department of aeronaltics:

"Development of the project for utilizing aviation in the work of saving life and property has been suspended during the past fiscal year, except in the matter of training personnel. The authority of Congress was obtained for the establishment, equipment and maintenance of ten aviation stations for the Coast Guard and a school for special instruction in aeronautics was also authorized."

Three officers have qualified as "naval aviators," seven enlisted men as "airmen" and three appointed inspectors for construction of aircraft. Three commissioned officers are taking instruction to qualify as "naval aviators," and five enlisted men are endeavoring to become airmen."

Civilians Not Permitted in Army Planes

New army orders prohibit all persons from riding in army aeroplanes other than members and employees, Aviation Section, Signal Corps, officers and enlisted men of the army, navy and marine corps and components in active service, heads of executive and judicial branches of the government, Senators and Representatives and civilian flyers examined for instructor positions.

How to Make Your Boat Leakproof

A booklet has been issued which is of interest to owners of hydroaeroplanes and flying boats entitled "How to Make Your Boat Leakproof," which can be secured from L. W. Ferdinand & Co. of Kneeland St., Boston, Mass.

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(*Continued from page* 1148)

ing their advantage in numbers, in aircraft, in heavy artillery, the Germans were beaten on the Marne, on the Yser, and then war in the trenches began.

"England and France made the most admirable effort to atone for their negligence. Hundreds of aeroplanes were built, hundreds of pilots hastily instructed, and the entrenched armies soon witnessed with growing wonder not only single-handed flights but regular aerial battles where the advantage generally remained with the Allies. As soon as one party had a marked advantages the other tried to go one better, and the contest would probably have lasted years had not Wilbur Wright's honored country claimed her share in the fight for air power—this new air power as necessay in our days to any great country as sea power has been during the centuries.

"Since the time of Washington, of Lafayette, of Rochambeau, the United States has grown by the light of those principles of liberty and justice which had presided at the birth of the republic. For more than a century the United States Government had held to the doctrine that European affairs were not her affairs and that American affairs were not the affairs of the European Powers. When one of the latter wished to interfere it was told, sometimes a little roughly, 'Hands off!'

"But was this war like other wars? Was the greatest Power of the world to stand aside during the last and decisive fight against tyranny and liberty? Was the greatest Christian people to look on and see the universe pass under the pagan yoke of servitude? Had the honorable United States duties to North America and herself alone? Did they owe none to the preservation and uplifting of mankind?

"Then came, clear, calm, decisive, the message of President Wilson proclaiming that the smallest nation had the liberty and rights as the greatest and proudest and that justice, not force, must be the rule among civilized peoples. What those words meant to us it is difficult for our American friends to understand.

"How many men like myself, who had worked all their lives with the hope of social progress, with hope of fraternity between classes and citizens of the same and all countries, of more justice, aye, of deeper friendship between nations, were not almost discouraged at the drift of events? And before the repeated onslaughts of the enemy we were obliged to ask ourselves: Have we been mistaken? Is the rule among classes and among nations the iron rule of might? Are Trieshe and Bernhardi after all right? Is the world to live under a yoke a life that is not worth the struggle?

"To our darkened sky the message of President Wilson brought back the standard of liberty and justice. We knew that the stars on the banner of his country stood for liberty and justice and equality.

"Soon thousands of pilots will carry that brilliant flag that means so much toward the Rhine by the side of the flag of the British Empire and the tricolor of the French. Then will be fought and won in the air the battle that will liberate mankind. Then the crimes of the invasion, the submarine warfare, the murders by aerial raids, the butchering of women and children will be avenged. The pride of the Kaiser and of Germany will be broken.

"When the victory necessary to the cause of justice, essential to the future peace of the world, is won, then the dark angels of terror and destruction will disappear from the skies and the big white angels will carry over the pacified roads of land and sea the message that was Wilbur Wright's aim and dream, the message of peace and good will."

The Struggle for Supremacy of the Air

IN an article in the New York *Tribune* on "The Power Behind the Mailed Fist," Hilaire Belloc offers some trenchant comment showing that the fight for aerial supremacy will be one of the biggest features of the coming campaign. He writes:

"During the campaign of 1918 also a new importance will attach to the fourth arm of the service—the air service. The year will see a vigorous and probably decisive final struggle between the two parties for supremacy in the air, each knowing that superiority there will more than anything else decide the issue of the compaign.

"During that struggle it is exceedingly important that the mass of general opinion, which especially in democratic countries has such an effect upon the conduct of the war, should not misunderstand the problem which is set to the soldiers and constructors. Hitherto there has been, on our side of the Atlantic at least, too much misunderstanding of this problem. The new science appeals strongly to public imagination; it has been foreseen and dealt with in popular romance for many years; the things that it apparently ought to be able to do are too obvious; the limitations are technical and for the most part unknown to the public. That is why there is a danger of a public demand for policies that cannot be carried out, and attention to which will only weaken the armies in their great struggles.

"The main thing for us to appreciate is the limitations of the new arm. There are certain very general rules in this connection which it is useful to remember. First—Aircraft are already highly specialized for the various uses they have to serve, and, as has been the case with the development of almost all machinery, their types are getting more and more differentiated as the arm develops.



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The original use of aircraft in war was for observation. That meant a comparatively restricted machine, for all that was needed was to spot artillery fire—that is, to command observation over places not more than a few thousand yards from the place whence the aeroplane started. You did not need to fly very high, for beyond a certain height observation became difficult. There was hardly any anti-aircraft artillery. There was no fighting in the air.

"There came next the phase when the observing aircraft were attacked by a hostile defensive system and fighting in the air began. I believe it was the English who first began it.

"From that moment a high differentiation arose. One machine was more effective because it climbed more rapidly than another; a second was effective for its speed; another for its wide radius of action. You began to get different types, to which were assigned special duties upon the field of battle. You also got the main distinction between work at sea and work by land, and the work at sea in its turn produced differentiated types when the observation and chase of the submarines became necessary. Lastly, a type was specialized on land to carry a great weight of bombs for the destruction of enemy airdromes, bridges and ammunition dumps, etc.; a type which specially considered the carrying of weight appeared, and a yet newer form of this arose when the German policy of bombing open towns in order to affect civilian nerves was inaugurated on a large scale. In this last work what was wanted was a long radius of action, rapidity of flight and a high weight carrying capacity, and the problem for the construction was, as far as possible, to combine these three conflicting things.

Limitation of Use in Different Types

"The lesson, then, which the general public has to learn from this first rule is that you must not expect the first arm to be turned at will from one job to another. You must not, for instance, in a general call for reprisals, expect aircraft which were designed for observation and for battle on the army fronts to undertake long-distance raids, etc. The public must not think, as it has hitherto too often thought, of the flying machine as one simple instrument, capable of any one of many uses. With each new need the public must be content to wait until there has been time to design and build a new type of machine on a large scale.

"The second rule to remember is that the reserves that this particular arm requires are enormous—especially in material. The rate of loss is so high, the coefficient of repair is so high and the time required for training fliers so considerable, and the personnel needed for the general work of aerodromes and the repairing shops is so large that the total flying done is a poor indication of the actual effort required, unless we know something of what these reserves ought to be.

Roughly speaking, the figures to bear in mind are the following:

For one machine in the air you must count from six to eight machines on the ground, and for one pilot in the air you must count three on the ground.

For each machine you must count within the zone of the armies, and quite apart from constructions and repairs taking place in the bases and manufactories at home, at least forty men.

Training and the Proportion of Loss

From these figures it is plain what we observe and read of the actual work in the air is only a fringe, as it were, of the total effort. The useful work done—the product—arises from a very much larger body of men and material lying behind the men and material that are in action. That is another form of limitation.

The rate of construction is another factor and the rate of trainn, another. Three months are regarded as the very minmum for the training of a pilot, and careful statistics gathered from the enemy's recent efforts at speed in this department prove to us that any attempt to lower the average time in training in order to have the advantage of this factor results in more than a corresponding disadvantage from the rapidly increasing proportion of loss in men and machines which follows on it.

The third rule to remember, and perhaps the most essential of all, is that the policy, fortunately inaugurated by the enemy—the bombardment of open towns and attack on non-combatant areas in order to affect the civilian opinion—can never be the main object or anything like the main object, of air work. If we were to take the mileage flown by enemy aircraft on the Western front since the first German raid on London last summer, we would find that the mileage connected with the bombardment of open towns, which looms so large in the press and public imagination, was an exceedingly small fraction of the whole—certainly much less than one per cent

The great mass of work is the work of observation on the immediate front, because the aircraft are the eyes of the army, photographing, spotting and reporting continually. Auxiliary to this, and almost as large, is the connected work of fighfing between aircraft for the prevention of observation. Next comes the work done in the way of bombing hostile aerodromes, ammunition dumps and points of concentration, etc., with the counter work of fighting the machines so occupied. Thus the whole mass of aircraft on both sides is at work within a comparatively short distance of the two opposing trench lines. Long distance raids are almost a negligible part of the whole.

Next, it is wise for civilan opinion to seize the fact that the radius of action for distant expeditions is strictly limited. Roughly speaking, an average radius of two hundred miles governs the general policy of raids. Here, as in the case of shipping construction and many other kinds of machinery, you have various conflicting aims which have to be compromised. To fly far you need a heavier supply of petrol, but the heavier the supply of petrol is the less spare margin of weight you have for bombs. You increase the area of the plane and find that there comes under existing methods of construction a maximum point after which greater plane area involves a smaller radius of action.

This limitation in the length of continued flight has a very powerful effect upon the policy of reprisals upon German towns. The Western lines are everywhere upon the soil of the Allies, except for a short sector in Alsace. The chief enemy civilian centres are far behind those lines. London, much the greatest of the Allied centres of population, is the most vulnerable point in the whole zone. The enemy can approach it over an area where he is largely free from hostile artillery, for the sea occupies more than half of his journey; he is guided to it under clear weather conditions by a well-marked estuary leading directly to his objective.

On French soil the enemy aerodromes are only half the distance from Paris that the French are from the nearest large German town. These conditions have given a great advantage to the enemy in his new policy of bombing large open towns from the air and making war on civilians. We hope to prevent it from becoming a precedent by his defeat, for if it becomes a precedent there is the end of our civilization. So far he has the Allied towns at a disadvantage from the causes mentioned above, and the chief duty of responsible journalists here during the last few months, after pointing out the disproportion between these raids and the work at the front, has been to warn people against demanding the impossible (as yet) in the way of full reprisals.


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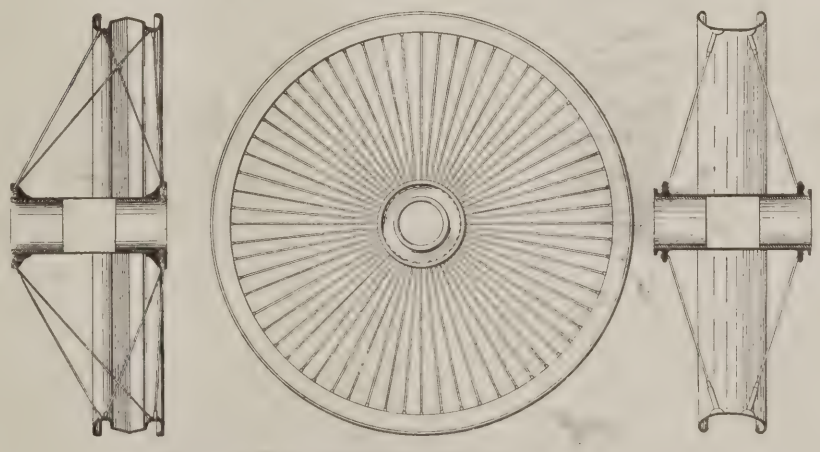
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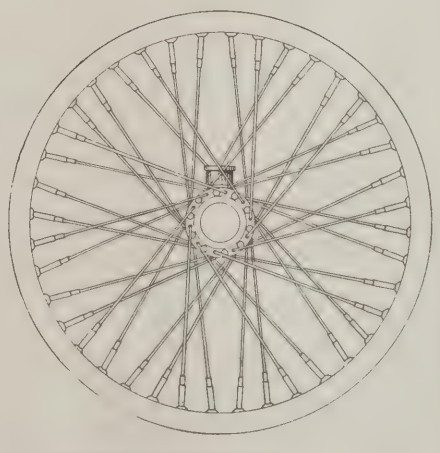
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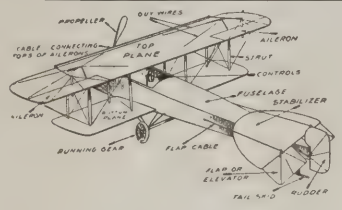
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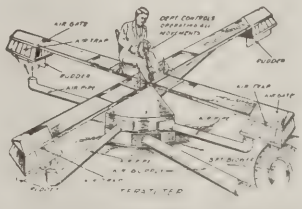


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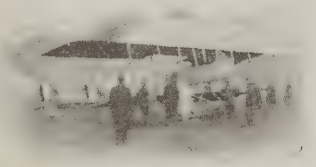
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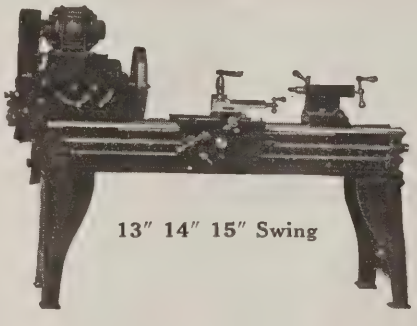


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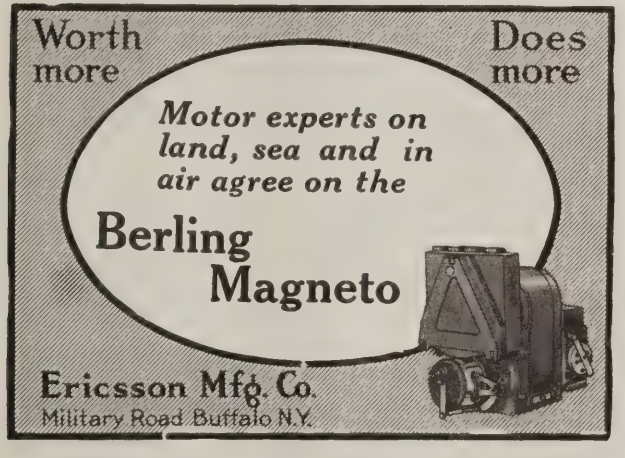
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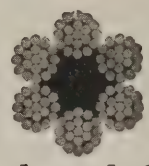


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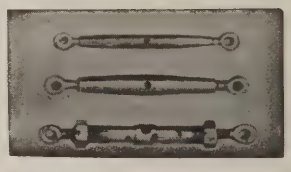
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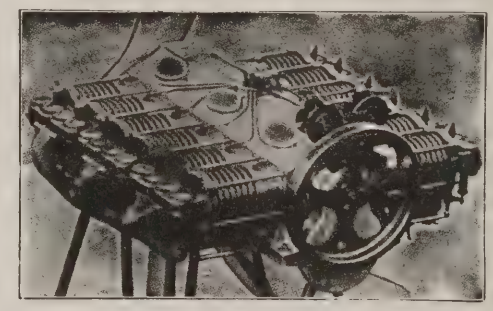
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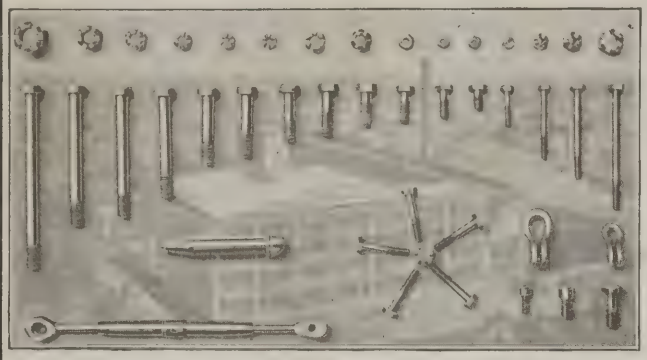
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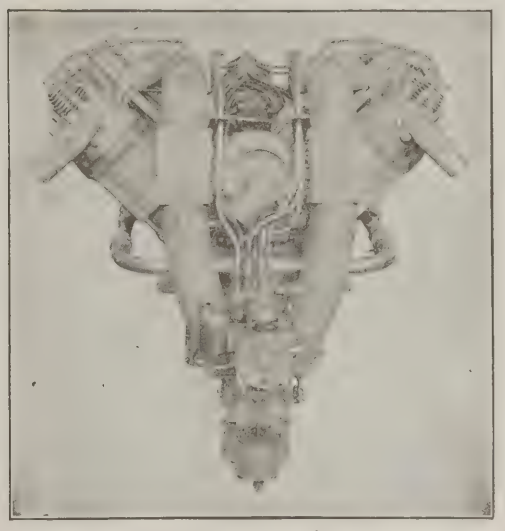
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